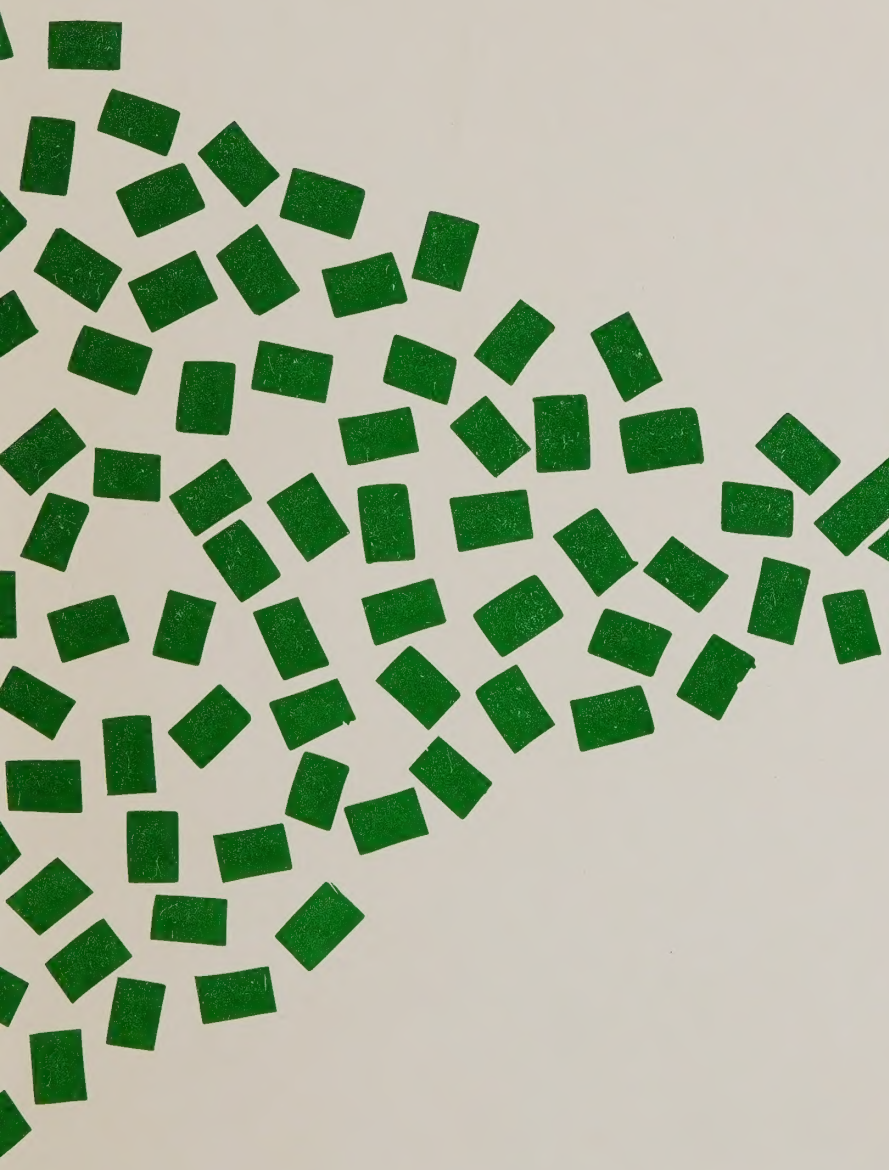

OPEN SPACE
CONSERVATION

GENERAL PLAN

MADERA COUNTY

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Prepared by Robert L. Wall, together with the staff of the Madera County Planning Department. These materials and plan element were prepared without Federal or State financial assistance. Some materials and previous study information, as well as excerpts from the Madera County General Plan, (which plan was funded by a 701 HUD grant administered through the State Planning Office), were used in support of these studies and plan element.

Photographs in this Plan Element were prepared by Pat O'Rourke, Staff Photographer for the Madera Daily Tribune or by Robert L. Wall. They are identified by P.O'R. and R.L.W. respectively.

June 20, 1972

Gentlemen:

Thank you for the opportunity to participate in this most interesting Open Space and Conservation Element of your General Plan. This staff work has been done in response to your directive and under the terms of the contract for the preparation of these materials.

This plan element deals with much more than just "open space". It deals with the fundamental stuff out of which this County is made, and with the basic materials that all of us need in our daily living and work. You will find in these pages that open space has been more appropriately defined beyond simply the conservationist's dream of unspoiled nature. Rather, open space is shown here to be related to virtually every kind of activity and economy that pertains to this County.

Most importantly, this report has been able to demonstrate that it is quite possible to maintain the necessary open space for the enjoyment and necessity of all of the public, yet using the land for a multiplicity of economic uses. Thus the plan element defines open space as a valuable but very useful resource. Consequently, this plan element does not predict or expound the thesis of preservation without use, but rather, expresses a dynamic program of land use within which open space is the primary, the basic and fundamental material on which all of the economy is founded here.

We hope that you will find valuable materials in the study portion of this plan element and that your difficult task of making important decisions regarding open space and conservation matters in the future will be made easier because of this plan.

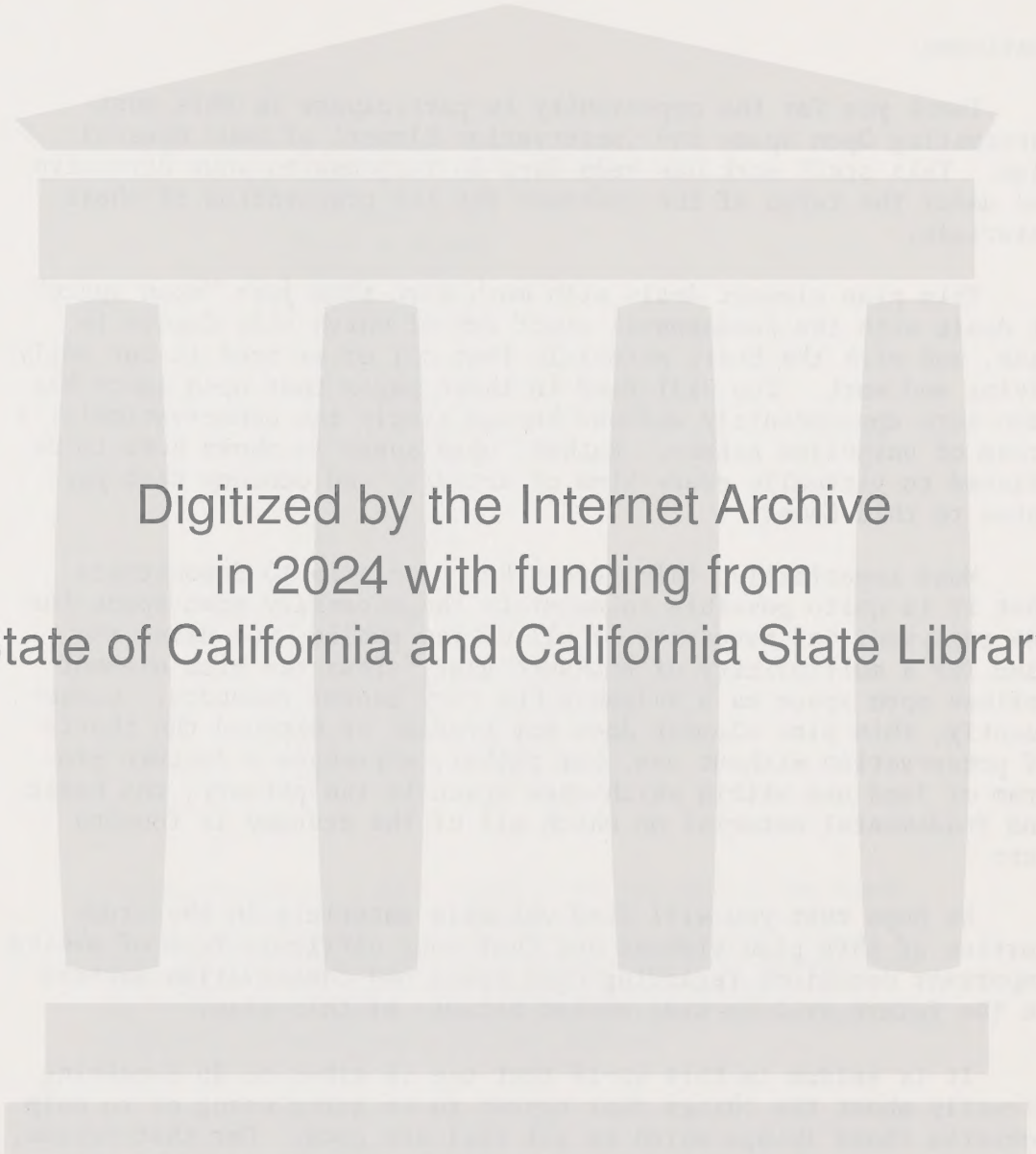
It is seldom in this world that one is asked to do something directly about the things that appear to be going wrong or to help conserve those things which we all feel are good. For that reason, I sincerely thank you for the opportunity to participate in this work.

Sincerely,

Robt L. Wall

ROBERT L. WALL
Madera, California

RLW/hr



GENERAL PLAN

OPEN SPACE ELEMENT
CONSERVATION ELEMENT

PREPARED BY ROBERT L. WALL FOR MADERA COUNTY, CALIFORNIA
1972

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DEFINITION OF OPEN SPACE

Open Space land is an area or a parcel of land or water essentially unimproved and devoted to an open space use such as natural resource land, agricultural land, recreation land, scenic land, watershed or groundwater recharge land, or wildlife habitat. Open space is essentially that which remains of the countryside if urban and suburban development is diverted from that area. Open space does not mean the total disuse of land. Some open space uses include the use of land for public recreation or the enjoyment of scenic beauty, or the conservation or use of natural resources and for the production of food and fibre.

The Legislature of the State of California recently found that the preservation of open space land is a necessary thing. Legislators felt that the preservation of open space land is necessary for the maintenance of the economy of the State and for the assurance of the continued availability of land for the production of food and fibre,for the enjoyment of scenic beauty, for recreation, and for the use of the State's natural resources. In discussing the importance of open space and the means of preserving it, the Legislators thought that discouraging premature and unnecessary conversion of open space land to urban or suburban uses was a matter of public interest and would be of benefit to urban dwellers as well as rural because it will discourage non-contiguous development patterns which unnecessarily increase the costs of community services to community residents.

An interesting study, including a cost-benefit analysis, was completed in the summer of 1971 by Jane Moran under the auspices and with a grant from the State Department of Conservation. Miss Moran's study verified the poor cost-benefit ratio accruing to a county in which urban sprawl is allowed to happen.

The State Legislature also felt it necessary to require cities and counties to make open space plans for the preservation of valuable open space land and to take positive action to carry out the plans by the adoption and strict administration of laws, ordinances, rules and regulations as authorized by their law.

Orderly growth and development of the State and the preservation and conservation of its resources was and is being sought in order to provide for the development by the State, by regional agencies, and by counties and cities of coordinated plans for the conservation and preservation of open space lands. By their action, the Legislature was attempting to assure that cities and counties would recognize that open space land is a limited and valuable resource which must be conserved wherever possible.

Further, the Legislature wanted to assure itself that every city and county would prepare and carry out an Open Space Plan which, along with the State Regional Open Space Plans would accomplish the objective of a comprehensive Open Space Program. In addition, they specified that these local Open Space Plans should be completed by June 30 of 1972. Further, they specified that every local Open Space Plan should contain an action program consisting of specific programs which the local legislative body intends to pursue in implementing its Open Space Plan. To that end, they specified that any action by a county by which open space land or any interest therein is acquired or disposed of, or its use restricted or regulated must be consistent with the local Open Space Plan.

To impress upon local communities the importance and great significance that the Legislature placed upon this act, they further specified that no building permit could be issued, no subdivision map approved, and no open space zoning ordinance adopted unless the proposed construction, subdivision, or ordinance was consistent with the Open Space Plan. In another part of the State's legislation of that year, dealing with taxation, the Legislators sand that they would not return certain monies to local communities to offset the tax reducing impact of Williamson Act contracts unless this Open Space Plan by the local community had been received and approved by the appropriate agencies in Sacramento.

The Legislature also said that every city and county, by January 1, 1973, should adopt an Open Space Zoning Ordinance consistent with the local Open Space Plan and then laid down some very specific rules for the possible issuance of variances.

Finally, the Legislature said of their Open Space Act that they did not intend that the exercising of this act by local communities would take or damage private property for public use without the payment of just compensation.

A Difficult Task

Thus the ground rules of drawing the Open Space Plan have been set by the Legislature. The task of the local county in preparing its Open Space Plan is therefore circumscribed first, by the State Law; balanced by the care necessary not to take property without compensation in the exercise of this plan; principally defined by the presence of existing public and private land use patterns; and finally, most probably capable of achievement with existing local law.

Environmental Resources Management

A special act recently passed by the Legislature allows the County of Tulare as a pilot project, and with Federal assistance, to develop an Environmental Resources Management Element for its General Plan. This element would contain the factors of an Open Space Element, a Conservation Element, a Scenic Highway Element, a Recreation Element, a Seismic Element, a Noise Element, and possibly a revised Land Use Element, combined into one comprehensive package. The Environmental Resources Management Element concept expresses the idea that perhaps the Legislature wanted to have all of these environmentally related elements of the General Plan coordinated with each other and with the Land Use Element of the General Plan. Madera County does not have the benefit of such a legislative mandate, nor the Federal assistance to carry out such a comprehensive preparation at this time. However, the preparation of this Open Space Element does contemplate the coordination of its factors with the existing General Plan of Madera County, and further, makes heavy use of the materials already compiled, analyzed, and reported on in the seven basic studies preceeding the recent General Plan for Madera County. Thus, should the Legislature of the State of California allow or mandate the preparation of an Environmental Resources Management Element in all counties in the near future in lieu of these several separate elements, this Open Space Plan for Madera County will be capable of immediate integration into that future element. If, on the other hand, no such legislative mandate or allowance appears, this County, its planning staff, its Commissioners and Supervisors, will still be able to perform the rational approach to integrating the Conservation, Open Space, Recreation, and Scenic Highway Elements with the other elements of the General Plan. The same purpose will be served.

CONCENTRATE OR DISPERSE - SOME OF EACH

The immediate concept of open space that comes to the minds of many people is that all development will be stopped. This is by no means the case in this plan for the conservation and long-term use of open space in Madera County. It is hoped that this plan elenet in conjunction with other elements of the General Plan of Madera County will work in concert to help to maintain different kinds of open space areas in appropriate places as the normal development of the County takes place over the years.

Some open space should be concentrated in large regional areas and continued in uses such as forestry and grazing in order to provide the maximum benefits to be derived from that kind of land use. In other cases where development of residential or other urban kinds of uses takes place, some scattered of dispersed small open space areas will be most appropriate in that context. In the more urban areas, the pattern of the distribution of open space areas will most certainly appear more as small, open space areas, interspersed in a largely urban development. In the rural setting, it is more likely that the pattern of development will appear more as residential or other structural uses, widely scattered throughout a generally open space.

This plan may help to provide the program for the maintenance of many currently useful and productive open space land uses in the future, which open space uses of land have great benefits in terms of the objectives of this plan.

Some Specific Policies and Objectives

1. Citizens of Madera County and visitors here now enjoy the experience of living, working, and playing in an area largely devoted to agriculture and rangeland activities. In addition, realizing that the agricultural and rangeland activities now produce the principal economic base of the community, it would seem appropriate to devise ways of encouraging people engaged in these land uses to remain in them and to be protected from undue economic and political pressures or systems tending to force them out of agricultural or rangeland production.

Therefore, it should be the policy of Madera County and related agencies to encourage the continuation of large-lot agricultural and rangeland uses in well-suited areas of the County.

2. The soils, rocks, topography, and other land-related features are indisputably tied to the ability to raise certain crops or to carry out certain agricultural and other activities profitably on lands here.

Therefore, it would be wise to relate the Open Space Plan for Madera County to the soils, topography, and other surface geological features.

3. Water is a most critical element involved in existing land uses or non-uses. Certain broad areas of the County serve as groundwater recharge space where continued grazing or agricultural use tends to maintain that groundwater recharge function, whereas certain other land uses causing the hardening of the surface and the provision of well-organized drainage systems detracts from that groundwater recharge function.

Therefore, it should be the policy of Madera County to include within its Open Space Planning Program the concept of preserving critical water recharge areas in sufficient quantity to insure the continued recharge of valuable groundwater resources.

4. Patterns of rural and suburban residential and commercial land uses have been established in parts of the County at this time. For various reasons, including the personal and corporate investments involved and the political difficulty, or sometimes impossibility of relocating some of these developments, it would probably be best to devise the Open Space Plan to avoid undue impact on already developed areas; however, providing that new development programs in and around these places help provide needed open space, recreation area, or other kinds of open spaces to make these community areas even better places to live and work.

Therefore, a policy should be emobodied in the Open Space Element providing that existing urban and suburban developed areas and those areas which are currently zoned, or for which specific development plans have been filed, be accepted as is; however, providing for the upgrading of these community areas in future development programs.

5. Certain corridors, such as State and some County highways, floodways of rivers, some canals and reservoirs, and routes now planned for in the State Park and Parkways Plan, already provide certain corridors of Open Space within the developing pattern of the Madera County Area.

Therefore, it should be part of the policies of the Open Space Element that these corridors be included in that plan.

6. There are existing areas for parks and there exists a General Plan of Madera County designating some park and open space areas.

Therefore, the Open Space Element should show those recreation areas designated on the General Plan and otherwise shown on various State and Federal plans for the County.

7. The National Forests, National Wilderness Areas, and National Park Areas in Madera County exist now and are shown on the General Plan.

Therefore, the policy of Madera County relating the Open Space Element to these State and Federal lands should include the presentation of those State and Federal Plans.

8. The Board of Supervisors of Madera County has designated a need for a corridor through the Sierra Nevada to provide right of way for a trans-Sierra highway. This highway, it is contended, would provide access to some of the open land otherwise inaccessible to the general public. Opponents of the proposal contend that severe environmental damage could be incurred if such an access route were allowed.

Therefore, the Open Space Element of Madera County's General Plan should outline the route for a trans-Sierra highway and recommend controls to minimize environmental damage nearby the route when the highway is completed.

9. A comprehensive plan for a public water supply system, referred to as the Soquel Project, and referenced in Bulletin 135 of the Department of Water Resources, has already been prepared.

Therefore, this plan should be embodied in the Open Space Element of Madera County's General Plan.

10. A General Plan for Madera County was completed and adopted approximately two years ago. Within that General Plan there are a number of features shown which would contribute to the concept of providing open space in the total future development program of Madera County.

Therefore, those related elements and factors in the General Plan should be reiterated and expressed anew in this Open Space Element, however recognizing new information and changes in land use development rends which have evolved since the completion of that General Plan.

11. There are wildlife factors existing within Madera County which are fragile and subject to catastrophic change or possible elimination unless care is taken to encourage their conservation.

Therefore, the Open Space Element of the Madera County General Plan should recognize the special wildlife needs and coordinate these needs with that Open Space Element.

12. There are two incorporated cities and a number of smaller, unincorporated community areas in Madera County for which General Plans and policies habe been devised. Within the incorporated communities and within a few of the unincorporated communities, there are current plans and concepts now available concerning open space.

These current plans and policies for the incorporated cities and for the unincorporated communities should be integrated with the County's Open Space Element of the General Plan.

13. There now exists a Zoning Ordinance and several ordinances dealing with land division control. These ordinances have a profound impact on achieving the purposes of the General Plan and particularly the Open Space Element of the General Plan. It is thought that these ordinances are adequate to the problems at this time.

Therefore, the existing ordinance structure of Madera County should be reviewed and expressed in terms of its ability to achieve the purposes of the Open Space Element of the General Plan. Suggestions may be made for future adjustments of those ordinances at this time; however, recognizing that any future changes in ordinances will be made only after very specific study and public hearings relative to each change, subtraction, or addition to that body of ordinances.

14. Federal, State, and regional organizations now operate under regulations and carry out programs and plans for the use and regulation of lands within Madera County.

The Open Space Element should review and relate these Federal, State, and regional programs to the County's Open Space Element.

15. The Williamson Act, allowing certain agricultural property owners to contract with the County to keep their lands in agricultural and other open space uses, thereby being assessed according to productibility of land rather than speculative value,has been in effect for four years. Much land now under contract or agreement may be suitable for inclusion in plans for long-range open space areas.

Therefore, the Open Space Element should review existing "Williamson Act" lands and include appropriate areas of that land in the Open Space Element Map.

16. Federal and State policies, the Williamson Act, National Park Service policies, and U.S. Forest Service practices , and similar programs tend to control some open space uses for regional or national purposes.

The Open Space Element should review the general impact of these programs and policies on the County and relate needs where apparent, for more regionally based inputs to the local economy where economic burdens are sustained by the County in helping to provide for the Open Space needs of the region or the nation.

Existing parks in the vicinity of the cities are an important part of the overall Open Space Plan for the region of Madera County. The Open Space Plan specifies close coordination between the city and the County in planning and developing new recreational areas.

Questionnaires and Public Meetings.

Questionnaires were distributed to a number of government officials, leaders of civic organizations, and persons who had expressed interest and initiative in planning and environmental issues in the past in this County. During a review of the questionnaires returned, and discussion in public meeting, a number of important practical aspects of the Open Space Plan were brought out.

Flexibility

One of the more significant comments indicated the need for flexibility in certain aspects of the Open Space Plan in order that future inclusions of land under Williamson Act law in contract with Madera County, (to be kept in agricultural or other open space uses), could be allowed. As a result of this concern, this plan is drawn and written to allow for controlled flexibility based on certain standards and criteria for entry and exit of lands from the Open Space Plan. It is not the intent of the Open Space Plan as shown on the map to be a rigid, unalterable document. However, the flexibility must be subject to careful tests in order to insure that it is fairly applied to all persons in order not to amount to a grant of special privilege inconsistent with limitations upon other properties in the vicinity.

Sequencing

Further analysis of the commentary on the returned questionnaires and arising out of public discussion of this matter indicated the importance of including a criteria for the sequencing of events in the preservation and long-term management of open space in Madera County. Recognizing that vast areas of Madera County are now used for open space purposes and further recognizing that some of these open space areas may, in the future, according to a carefully drawn plan or according to criteria established for fair administration and adequate maintenance of sufficient open space in the future, allow for adjustments in order to achieve the best Open Space Plan possible.

P.O'R.

Aesthetics

Recognizing that many open space uses allow for continued profitable use of the land, there was nevertheless expressed concern for the aesthetics and appearance of structures on some of this land. As an example, it is recognized that agricultural land use generally contributes to the aesthetics of the region,however noting that the proliferation of billboards and other signs not related to the use of the land at that place, tend to destroy or detract from the aesthetic values ordinarily found in such land uses. Thus it was suggested that the Open Space Plan contain some proposals and eventually find a means of implementing ways to preserve the appearance of open space among the existing and future profitable land uses in the County.

Positive Preservation

Some other discussion expressed a need for the consideration of the balance between permanent open space proposals and interim open space proposals and for devices to encourage land development practices which would tend to preserve the open space needed and wanted by positive means rather than by purely negative regulatory means.

Implementation

A later portion of this Open Space Plan has a review of existing ordinances and laws that will tend to carry out the objectives of the Open Space Plan. Certain adjustments of policy by the Board of Supervisors of the County and some of the administrative rules of individual departments would be expressed as a means of making maximum use of existing law to achieve the purposes of the Open Space Plan. Activities by the Local Agency Formation Commission, the local Council of Governments, private and civic organizations, and State and Federal agencies will also be expressed.

The population of Madera County remained nearly the same during the intercensal decade; however, slowly changing its characteristics to include more technically-oriented persons and slightly declining the proportion of untrained and unskilled persons. The development and redevelopment of urban facilities for the people of Madera County is currently encouraged to go into or immediately adjoining existing urban centers. This "growth centers" concept serves the dual purpose of providing the ability to generate urban services to these people for less tax money while, at the same time, contributing to the conservation of the agricultural economy and the agriculturally-related open space. The zoning and land use controls leading to the diminishment of scatteration of urban uses throughout the agricultural areas of the County thus contributes to higher efficiency of public services and greater possibilities for the conservation of open space.

P.D'R.

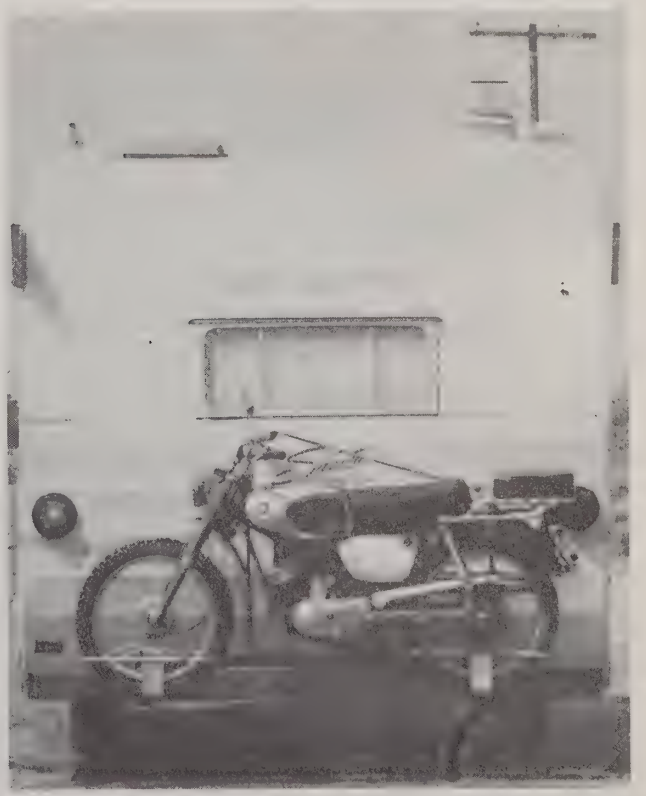
The psycological values to the human spirit of open space are difficult to explain in a prosaic document such as this; however, it is at least partly for the reasons that human beings enjoy open space that we make this effort to conserve it for the enjoyment of all of us in this place in the future. It is to places like this that overcrowded urban dwellers come for recreation; the restoration. To those of us who live with this open space each day, it is perhaps not so easy to understand the great psychological value of green and natural places.

The origin of many summer vehicles in Madera County is outside Madera County and the destination is primarily the mountain recreation areas, including Yosemite Park.

The oldest but most persistent kind of transportation in Madera County still performs effectively. Recreational horseback riding, however, is increasing greatly while working horses are holding their own.

Pat O'Rourke Photo

Recreation vehicles abound. During the summer, nearly five times as many vehicles use these roads as there are registered vehicles here.



Pat O'Rourke Photo

A skateboard provides this miss with an enjoyable ride. Riding or driving any kind of vehicle provides a major form of recreation. Recognition of riding and driving as a recreational activity should affect design and planning policies for roads.

Family bicycle riding exhibits another aspect of recreational use of the transportation net in the County. There are no specific bicycle paths at this time.

More evidence of the recreational values of the County being accessible to citizens from far away. The annual summer influx of the motorcycle clubs to Madera County brings several hundred "bikes" to the mountain recreation areas and generates mixed reactions by local residents.

Pat O'Rourke Photo

ECOLOGY

Ecological considerations have gained great popularity in the last year or two. New legislation now requires that Environmental Impact statements be made on new subdivisions and land developments, as well as most public projects in order that the interrelationship of the various aspects of the natural resources about which we have been speaking here can be analyzed and some projection made of the potential changes that may ensue. It is common practice to assume that any change in a natural situation is detrimental; however, purposeful enhancement of natural systems, particularly in the context of an Open Space Plan, can be expected. Indeed, it is the purpose of the entire planning process in Madera County to find the means of guiding the current economic, cultural, and physical trends in the County to enhance the future environment of its citizens and those who visit it.

This report shows how each major component of the natural resource base has been shaped in development by its interrelations with the other components. It has been shown how the County's geographical location and land forms ultimately determine, (through their control of climate, water supply, and soils), limits of a natural resource base. Considering these limitations in practical terms, all of the elements of the climate, land forms, soils, vegetation, water supply, and wildlife, continually interact with one another, any change in one element will sooner or later contribute to changes in one or more of the others. A part of our objective in this study and plan element is to relate the anticipated impact of changes in open space lands to these other factors of the natural resource base. Conversely, we can see from an understanding of this natural resource base, how we might fairly and equitably go about conserving some open space naturally as a result of conserving some of these other natural resources. Finally, we must certainly gain the understanding that open space is necessary to the perpetuation of some of these natural resource functions and systems that we now enjoy.

Additionally, there is the consideration of the natural resources and open space of this County in the context of the Central Valley Region and particularly in the context of the State of California and perhaps the nation. In the introduction to this report and plan, a policy was stated that the people of this County would hope to find a fair and equitable way of paying for the preservation and conservation of certain open space and open space related resources that are of benefit to all of the people of the State and to the Nation. Although we shall say more about the County's economy in a subsequent chapter, it is important at this point to recall that the principally agricultural economic base of this place, with the relatively low levels of economic production related to areal space, (as compared to intensive industrial uses in places such as South Chicago, Detroit, Houston, and other intensely industrialized areas), places the County in a relatively poor economic position to support any real money costs evolving from a program of preservation and conservation of open space locally. That, perhaps, is the most important relationship between man's economic activities and the ecological considerations expressed here, despite all else we may wish to do.

Fortunately, a high proportion of the population in Madera County is engaged in agriculture or in industries related to agriculture. A general knowledge of the value of conservation and a healthy respect for the side effects of alterations of physical factors is already available to people here. On the other hand, many persons here cannot recognize the value of the open space resource in which they dwell. By not having lived for a significant period of time in intensely occupied areas, they may not have developed the nearly frantic appreciation of open land areas that most urban dwellers experience. Although local people may never live in intensely developed urban areas, nor have much sympathy for those who do, we all must realize the political implications of more than 80% of this State's population living in such metropolitan areas and, of course, having considerable impact upon State governmental decisions. Appreciation of the magnificent open space resource which we possess here must certainly lead to some feelings for the conservation of it, if this can be done fairly and within the context of our democratic society.

As population increases, both within and outside the County, competition for and pressure on the limited open space resources base increases. Most new pressure for recreational use of our land, air, and water resources can be expected from metropolitan areas, outside of this County. To avoid inadvertently limiting our resource choices tomorrow, a stronger awareness of the links between our attempts to influence one resource and the resulting effects on the total resource picture, both immediately and in the future, is needed.

For example, one obvious side effect of increasing population, (usually agreed upon as necessary for "development" or economic expansion), is an increase in automobiles, the potential for air pollution, and eventually, smog. A related concern on which research is presently being conducted nationally is the specific atmospheric polluting effects of lead derivatives that are added to gasoline. Recently, the question was raised whether or not a long-lasting snow pack adjacent to areas of large population might become laden with dangerous air-borne pollutants. This would be of concern in Madera County where much of the water supply is fed originally by the snow pack.

While some disruptions of the County's natural environment may result from external causes or be indirectly caused by such factors as modern transportation, most result from our own local interferences with some specific strand in the overall ecologic fabric. Thus we change the vegetative cover by farming, burning, (intentionally or otherwise), chemical or mechanical treatment, and lumbering. We dry up some waterways and create new ones, remove vast quantities of water from the ground in one area, but recharge it in the course of irrigating elsewhere; and we may yet wring rain out of the clouds at places and times of our choosing. We attempt to exterminate certain insect and bird populations (thereby encouraging others), and seek by game law protection to protect or to increase the numbers of other wildlife species.

The point is not that all of these resource uses or changes we seek are necessarily undesirable, but that the elements we manipulate are all interrelated, (some delicately), and that undesirable changes may unintentionally emerge from these activities. We are far from certain that we know all of the indirect effects of widespread intensive use of agricultural pesticides or of controlled burning and mechanical removal of large areas of foothill vegetation, although at present the steady drop in the level of water in the water table appears to have been substantially checked by Madera Canal water, the long-range possibility of saline water intrusions upward and eastward depends upon the balance between continually expanding water needs and the finite fresh water supply.

A familiar example of such an ecologic relationship is the deterioration of mountain meadows in the eastern county, resulting from, or at least accelerated by intensive stock raising. Although the exact relationship between stock animal use and meadow replacement by forest trees and brush is unclear, it is known that the acceleration of tree reproduction was coincident, (especially in the early days), with the time of heavy livestock use. At a 1962 conference, sponsored by the Wildland Research Center of the University of California, the following illustration of the sequence in Madera County was given.

"As a recent example, take Jackass Meadow: originally 880 acres of sub-alpine grassland, it lies at 7,000 feet elevation, 8 miles south of Yosemite National Park, in the Jackass grazing allotment of the Sierra National Forest. This area was fenced during the 1870's for use as a holding pasture in spring, as winter snows melted, and in fall until gathering was completed. At the turn of the century, both sheep and cattle in large numbers grazed the area. In the memory of the present permittee, as many as 1800 head of cattle were held in the fenced area, spring and fall. In the early 1920's, according to Forest Service records, 18 permittees ran 1,430 head of cattle on the Jackass allotment annually during the 3½ month season which started before the snow was gone..."

"Today, four permittees run 650 head on the same area for 2½ months, starting July 1. The acreage of the meadow has declined 60%, to 350 acres. 530 acres are now lodgepole pine forest."

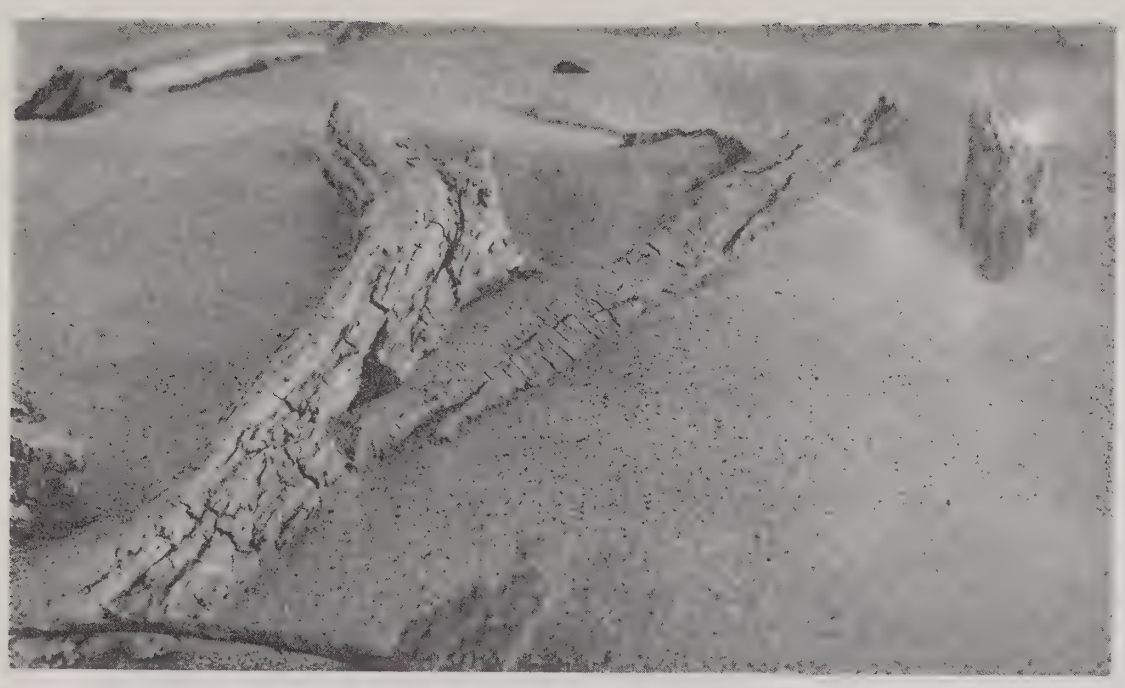
"Lodgepole pine is often present, especially in meadows, in the sub-alpine zone of the Sierra forest complex. Its role, however, is primarily successional. It is not exacting in its soil requirements and grows on a wide variety of soils. In the Sierra Nevada, generally, the incidence of small lodgepole pine stands within ponderosa pine stands is determined by the presence of a clay pan, impervious to moisture under the lodgepole. This places some doubt on the drying out of a meadow following prolonged heavy grazing as a cause of lodgepole invation."

*"Seed germination is best in full sunlight and on mineral soil, free of competing vegetation. Certainly prolonged heavy grazing is destructive of vegetation which in turn bares the soil surface proportionately. This, therefore, appears to be a likely explanation of the rapid invasion of some meadow areas by lodgepole pine. Disturbances other than grazing, of course, would effect the same end and the declining incidence of fire in recent years, too, might well be a contributor. These factors simply accelerate the natural process of plant succession."**

Thus, although there was certainly no wish to reduce the area of mountain meadow, this was one side effect of grazing. Yet the maintenance of sizeable and healthy meadow areas as a scenic attraction and a recreational asset is also important to the County. We are suggesting here that to focus on the most direct way of reaching a single goal in using our resources may conflict with our other, equally important, goals.

Finally, we would do well to avoid using our resources in ways which unnecessarily disrupt the less tangible aspects of the County's natural environment. It may be more difficult for Maderans to share the perspective of non-residents who find a major attraction in the County's "empty space" and absence of intensive development. The protection of these intangibles - striking scenic resources, large open spaces, clean air and water, and wild areas - may, from one point of view, appear as an inhibiting force on the County's economic development. A large and growing share of the County's economic development, however, will be based upon the recreational assets and amenities which it can continue to make available.

* University of California, Wildland Research Center, Research and Land Management in the Upper Sierra. A conference on interrelated problems of natural resources conservation, May 25-26, 1962, pp. 84,85.



Nature's discards of sand and driftwood seem to be part of nature's trash heap; however, making important contributions to water quality and the wildlife cycle.

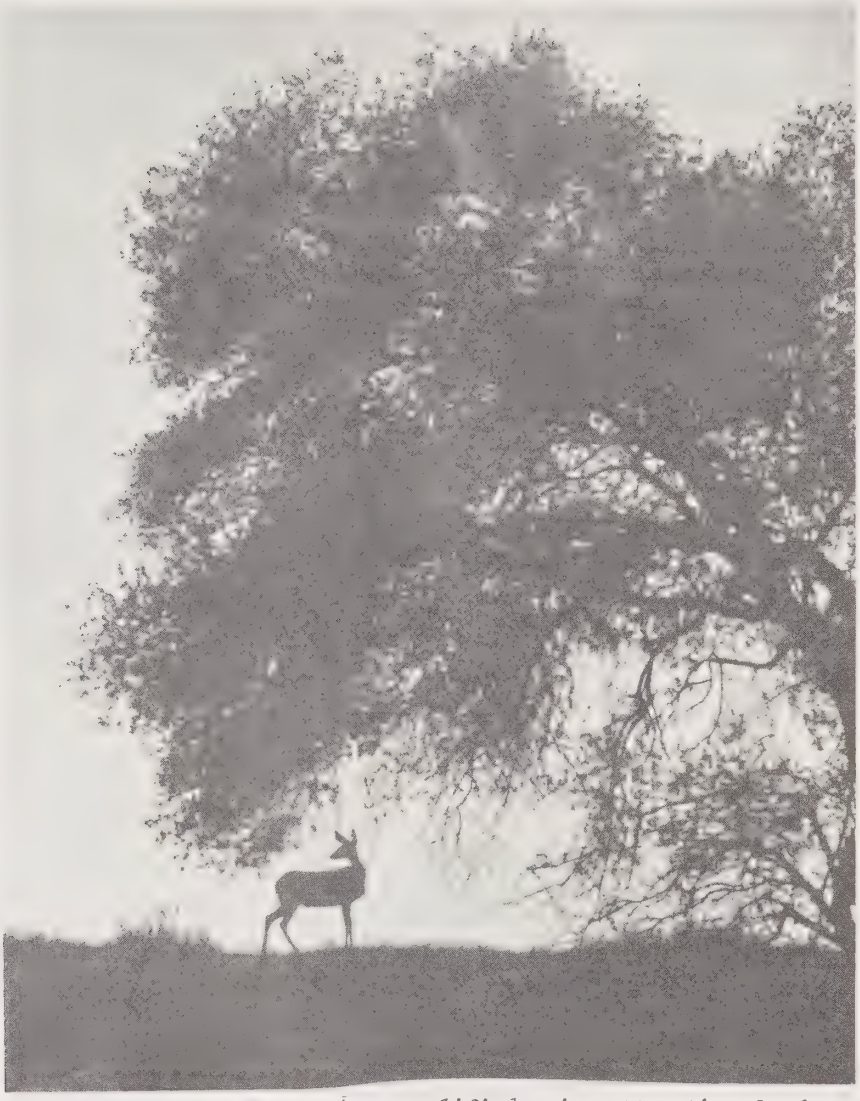
P.O'R.

P.O'R.

From the point of view of the ecologist, each part of the wildlife cycle is as important as each link in a chain. The weakening or destruction of one of those links may destroy or seriously endanger the entire cycle. Such animals are integral part of the total open space picture.

Riparian vegetation has value both as a scenic thing and as wildlife habitat. Many small creatures inhabit this vegetation and participate in the ecological cycle leading to larger forms of wildlife. Some riparian vegetation contributes to an improvement of water quality flowing in the adjoining streams.

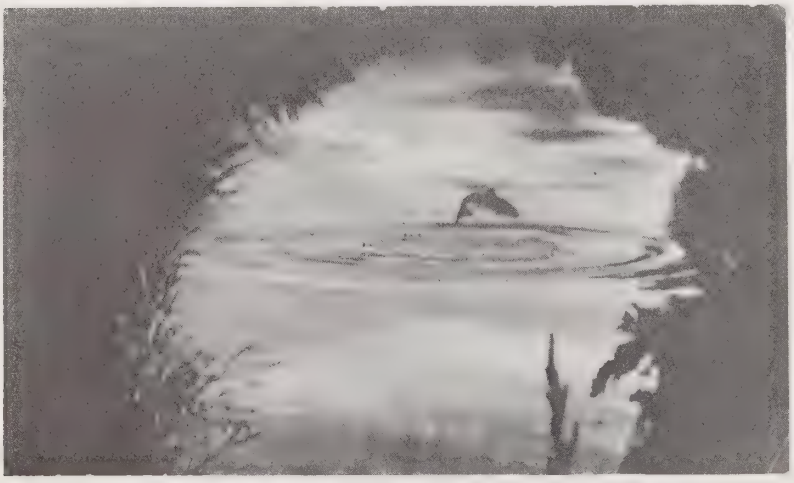
P.O'R.



P.O'R.

An unqualified major attraction for hunters in Madera County. More deer are probably killed in Madera County each year by being hit by motor vehicles than are shot during the hunting season. Attacks of domestic dogs in urbanizing areas of the mountains also destroy many deer. Environmental impact statements, now required prior to the construction of major public or private facilities nationwide, may contribute to some adjustment of development patterns in the future which may alleviate some of the unnecessary pressures on local wildlife.

Fish life in Madera's streams, lakes and canals are both a powerful attractor for sports fishing and nature's best indicator of clean water. In general, water that is not clean ehough for fish to live in is unacceptable for most other human uses. Like the canary in the mine, the fish, therefore, give us an indication of the safety of our waters.



P.O'R.

This touches upon the central problem of maintaining environmental quality in the face of growing populations. That is, "the more people who crowd in to use a resource, the more battered, and the less desirable that resource becomes". This, of course, is really a complex of problems that no one county can, by itself, resolve. It will require our best efforts and thought as a County, together with State and National agencies. An awareness of the complex interrelatedness of our resource actions and their many consequences can, however, help us find ways to adjust development to the natural environment. That understanding may help us to maintain open space where we want and need it at little cost, other than a little planning.

In the 1964 special report to the nation, the U.S. Department of the Interior, with an eye on the race to the moon headlines, characterized efforts to solve our natural resource problems as "...the race for innerspace - the preservation of balance and sanity and solitude on our own planet..." In words which apply as well to Madera County as to the nation as a whole, that report made the following observations:

"How many persons will leave this world during the next century to establish residence elsewhere in space, we cannot know, but we do have a fair idea of how many people will be sharing this earth a century hence, and we can predict, with a modicum of accuracy, what will be their condition if we fail to turn our zeal and ingenuity to exploring the capabilities of the inner space which most of us will have to continue to occupy."

"Our destiny depends more on the use of the space we now have than upon the acquisition of real estate on other planets. It depends upon the use we make of the outer crust of this earth and the atmosphere which wraps it."

"Science can provide the answers which will enable America to move ahead at a greatly accelerated rate but if, when we get there, we find only a shambles, it will then be too late to ask, 'what was the use of all that speed?'"

*"The time to wonder and worry about what this country will look like 25 years from now is today."**

U.S. Department of the Interior, "The Race for Innerspace, A Special Report to the Nation, (Washington, U.S. Printing Office, 1964), Pages 5 & 6.

A significant portion of Madera County's open space lies within the jurisdiction of the Federal government. Nearly one third of the territory of Madera County lies within the jurisdiction of the Sierra National Forest, the John Muir Wilderness Area, or Yosemite National Park. Smaller areas are controlled by the Bureau of Land Management,

The Minimization of Sprawl

The creation of what appears to be premature subdivisions, at least for the purpose of providing places for current urban or suburban persons to live, has created some severe political problems and apparently some economic problems in Madera County. The drawing of illogical boundaries for eventual urban development can be considered to be another problem. The hop, skip, and checkerboard development at low densities on the fringes of our urban areas is another problem. The loss of valuable agricultural land to urban development does seem to be a negative development in an area whose economy is so deeply based upon the health of the agricultural economy. High maintenance costs for streets, water, sewage, and utility lines and for other public services such as police and fire protection, school busses, provision of water and reasonably surfaced roads are some other problems. The alteration for the worse, or in some cases, the nearly total destruction of wildlife areas, groundwater recharge areas, and certain irreplaceable scenic reaches of the County produces what many people have expressed to be problems.

The development of an Open Space Plan to cope with many of these problems and to devise a means for preserving and perhaps enhancing the open space areas of Madera County while maintaining a reasonable balance of ecology and economy is the objective of the Open Space Plan.

P.O'R.

the Department of Agriculture, and the State Park System. Although less than one tenth of one percent of the land in Madera County is owned by the County, little need for County park lands can be locally recognized in the face of the vast public and private open areas otherwise generally available for the enjoyment of the public.

R. L. W.

Balloon Dome on the Upper San Joaquin River Gorge is composed of the intrusive granitic "basement rock" exposed by the erosion of covering softer materials and showing the effects of glaciation along its side.

NATURAL RESOURCES

The natural resources of this County are the stuff out of which we must build our environment; they form the basic foundation of our environment. These natural resources are hardly importable from any other place; we should exercise some little caution in their use. Open space is one of this County's most valuable resources in its present state of economic development. As other parts of the State of California become more and more developed with structures and uses which tend to use up open spaces, this resource becomes ever more valuable in the regional context of the State of California. At the same time, however, economic pressures rise in terms of real and immediate proposals to develop non-open space uses of these lands and from the impact of some more speculative land division proposals. These latter land division proposals are somewhat less obvious precursors of the demise of open space in the future. Even the development of basic facilities for streets and sewer and water begin to change the aspect of the land away from its original open nature immediately. As an example, the difference between open grazing land an an adjoining unoccupied subdivision is quite obvious to the eye. The presence of paving, street signs, fire hydrants, and ungrazed weed growths immediately diminishes the open character of the land.

This mild diminishment of the character of the open space may not be a very serious matter at this time, but does indicate a developing trend which, if totally unchecked and unregulated, could lead eventually to the virtual disappearance of these former raw, rolling, open areas. From this it is possible to see that the economic well being of the cattle grazing operations in this County as related to the economic alternative of selling out to a subdivision organization is an important consideration when discussing the long-term preservation of open space as we know it.

Open Space, like many other natural resources, has a broad value to many people in the community, even though they themselves may not own the land on which the natural resource lies. For example, most appraisers generally recognize the value of a homesite which looks out upon natural, open, generally undeveloped lands as opposed to that one which looks out upon other dwellings or other urban features nearby. Thus a community like Madera County, with broad reaches of open space, does possess a natural resource which spreads its value among all of its citizens and among all of its visitors. The conservation of this universally valued resource of open space can be achieved fairly and equitably, within the context of our high regard for the right of private land ownership, is a fundamental consideration. We recognize that open space is a natural resource; we recognize that open space as a natural resource has value to all of us who live here and to those of us who visit, and thus we feel compelled to seek the means to conserve the valued resource.

The Physical Setting

Madera County contains an area of 2,144 square miles within its borders. It is located in the center of the State of California. The exact geographical center of the State lies just a few miles east of the City of Madera. Madera County is one of the eight San Joaquin Valley counties and is bounded on the south and west by Fresno County, on the north by Merced and Mariposal Counties, and by Mono County on the east. The County is about 96 miles long in a northeast-southwest direction and approximately 23 miles wide. There are three distinct physical regions; the valley, the foothills or dissected uplands, and the mountains or Sierra Nevada. Elevations range from approximately 110 feet above sea level at the northwest corner of this County to a high of 13,159 feet above sea level on the peak of Mt. Ritter.

The economy of the County is primarily one of agriculture and agriculturally related industries. Irrigated cotton and grapes and new developing trends in dairies are the chief income producers in the valley portion of the County, while cattle and dry farmed grain occupy the foothills. The mountainous region of the County has an active lumbering and mineral industry with the largest single economic activity in that region, recreation.

Madera County's soil, water, mineral, vegetative, wildlife, and scenic resource capabilities are based, in the first place, on its physical structure; that is, the slopes and shapes of its surface, the nature of its underlying bedrocks, and its surface drainage pattern. Its climate is of equal importance and interacts with these three, but it is convenient to reserve a survey of the County's climate to a separate area of this report.

Geology and Land Forms

The geologic history in this part of the world is discussed in detail in the Natural Resources Study of Madera County. Early deposition metamorphosis, folding, intrusion of molten rock beneath these materials, and the eventual exposure of the major structures by erosional activity provides the current nature of landforms here. Generally, landforms and mountain masses related to more recent igneous activity, where volcanic extrusions predominate, are found in the far eastern end of the County, at the eastern side of the Sierra Nevada. The highest portions of the Sierra generally expose the old intrusive lamatoid igneous rock earlier intruded within the former folded low mountains that occupied that place. Subsequent uprising and erosion, including periods of glaciation, have produced the sharp, bare rock mountains of that part of the County.

The foothills region of Madera County is generally described as the dissected upland and contains areas principally made up of metamorphics with hard, resistant slates, schists, quartzites, and gneisses from originally weakly consolidated strata of shales, sandstones, and siltstones.

The valley portion of the County began with a marine silt deposition period and subsequently was replaced by continental or terrestrial depositions of materials dropped by the rivers and streams running down off the uplifted, eroding Sierra Nevada. In a few places in the dissected uplanded area of the County there are some flat or table topped areas. These are principally the remnants of areas overlain by thick layers of extruded volcanic material which combined heat and pressure to change or metamorphose the rocks lying beneath the volcanic material. Today, the original overlying volcanic material is mostly eroded away, leaving the tables as examples of the original land surface at the time of covering.

A significant part of the geologic history of the County includes the time of the glaciers. Most of the sharper, bare rock features of the Sierra Nevada today can be attributed to the glacial action. The last major glaciation took place approximately 11,000 years ago; however, some small examples of local glaciation can be seen subsequent to a series of years with combined low temperatures, and high amounts of snow cover. This combination causes the compacted snow to become an icy mass and remain in some high altitude areas. The last of these minor glacier areas was observed by this writer as little as four years ago on the north slope of Eisberg Peak in the east and southern portion of Yosemite National Park.

A most important change of the geological history of landform formations of the County occurred when the early general pattern of stream flow from the northwest to the southeast changed to a flow to the northwest when the Sierra uplifted. In addition to changing the direction of the flow of the rivers to their present generally northwesterly direction, the uplifting of the Sierra Nevada caused a greater interception of moisture laden air sweeping in on the westerly winds from the Pacific. This caused a greater amount of precipitation to fall in both snow and rain and therefore increased the erosional factor by bringing down more water in the area.

One of the more interesting geological phenomena in Madera County occurred along the eastern edge of the Sierra approximately 100,000 years ago when molten lava poured out of vents and streamed westward to form a frozen lava flow. Subsequent glacial action, which plucked large blocks of the jointed, cooled lava away from the mass, excavated much of the original lava flow but left large post-like remains of the lava, today called, "The Devil's Postpile". Other volcanic features in that area include large masses of tuff and pumice.

Present Landforms

The Valley

The western third of Madera County is comprised of a portion of the San Joaquin Valley which, in turn, is part of the Great Central Valley of California. The valley is a huge structural trough between the Coast Range and the Sierra Nevada. The deposition of enormous quantities of alluvium on the valley floor gradually filled it to this time when the valley is seemingly flat and featureless plain. The valley portion of the County, however, may be divided into three physical regions, despite its apparent lack of features. The low plains, or alluvial fans, are one of these physical regions; the river channels and floodplains form a second physical region, and lastly, the overflow lands form the third region.

Throughout the entire valley, almost no consolidated rock types appear at the surface. Surface geology consists of a variety of alluvial or stream deposited soils and unconsolidated deposits of sediment.

Present knowledge of the valley subsurface geology in Madera County indicates that alluvium is not found consolidated into sedimentary bed rocks until depths ranging from 500 to 2,000 feet beneath the City of Madera are reached.

R.L.W.

Landforms along the east side of Madera County's valley area include the rocky, tree-studded foothills in the upper right; a remnant of metamorphic rock on the flat-topped butte near the center; the flatter, slightly dissected alluvial plain on the left; the Madera Canal, running from the lower right to upper left; the Fresno River running to the left, near the top of the picture; and an interesting series of fractures (occupied now by lateral streamcourses) in the lower left quarter.

This land is principally used for cattle grazing, although speculative subdivision has encroached on the lower left.

This area forms a large part of the great open space in the unirrigated part of the valley.

R.L.W.

The great expanse of levelled, irrigated and finally cultivated lands in Madera County not only provides the underlying basis for viable, profitable economic activity, but also automatically generates vast reaches of open space. It is obvious then that the continuation of agricultural enterprise in Madera County can maintain the future open space here. The most recent crisis for agriculture involving over-taxation in terms of urban standards of assessment has been averted by the application of the Williamson Land Conservation Act to provide an appraisal of value based upon the ability of land to produce an agricultural product and not upon its speculative value for some remote but very imminent speculative lot sales program. The implementation of current regulations regarding land division and land use can provide a rational basis for the continuation of agriculture and the conservation of open space in the future.

General Plan
Open Space &
Conservation

P.O'R.

The low plains and alluvial fans can best be defined as a belt of coalescing alluvial fans of relatively low relief located between the dissected uplands and almost level surface of the valley trough. The local relief is almost everywhere less than ten feet and most commonly less than five feet, with the exception of the land bordering the streams. The land surface in the valley is about 140 to 150 feet above sea level on the west, rises gently to elevations of between 300 and 400 feet some 25 miles to the east, giving it an average slope of about eight feet per mile. The geologic units underlying the low plains and fans are quaternary alluvium and possibly some Pliocene sediments cropping out on the higher fans. These are unconsolidated materials; that is, they are not yet compacted into a rock material. The most eastward areas of the alluvial fans reaching up to the foothills are much like the old alluvial sediments, however, concentrations of volcanic ash and pumice are found in these formations and some of these are mined for use in building bricks,as a carrier for insecticides, and as an additive in concrete manufacture.

The productivity of the soil on the low plains and alluvial fans has been increased with the development of irrigation water in the valley. Irrigation has also decreased production in some parts of the valley, mostly on the far west side. The seepage of irrigation water into the water table in the higher levels of the valley has initially raised the water table in the valley trough. It rises by capillary action to the surface and evaporates. The groundwater of the drier west side contains much more salt and, in the process of evaporation, these salts are left to accumulate in the soil. These accumulations of salts in the soil are most commonly referred to as alkali. Concentrations of alkali in the soil have caused considerable damage and inconvenience to westside ranchers; reducing much of the land to grazing use only. However, with adequate drainage and sufficient water, much of the land can be reclaimed by leaching or dissolving the alkali. During the process of reclamation, only the most salt tolerant crops are grown such as cotton, barley, or alfalfa. Some of these reclaimed lands in that area today are suitable for the raising of asparagus. Just outside of the County some of these areas are being used today with new water sources for the production of cantaloupe and some other high-valued vegetable crops.

Agricultural development on the alluvial fans of the eastern half of the valley is much more important. Here the land is divided into small farms where the land use is quite intensive. The majority of the farms in the area specialize largely in the production of fruits and field crops which grow extremely well in the warm, temperate climate of the valley. Cotton is also an important field crop.

Cotton's competitive position with some of the more intensive uses is partially maintained by current Federal agricultural practices which provide subsidies for limiting cotton production on lands which have a history of producing cotton in the past.

River floodplains and channels occur as narrow, disconnected strips crossing the plains and uplands at approximately right angles to the Sierra Nevada. These areas have been flooded in recent times and generally lie just below the level of the surrounding terrain. The adjoining lands often slope away from the river due to periodic deposition of the materials when the river overflows in flood stage. Thus in the valley portion of the County, local drainage does not flow to the river channels, but rather, away from them in areas immediately adjoining the channels of the larger streams and rivers. However, those streams originating below the foothills line in Madera County generally have a more standardized dendritic drainage pattern wherein the waters flow into the stream from the adjoining lands.

The greater the distance upstream from the mouth of the river, the deeper the river channel has cut below the surface of the surrounding alluvial plain. Conversely, the lower or southwestern reaches of the major streams tend to lie almost on the surface and, in fact, with artificial diking in some cases run the bed of the river within dikes above the level of surrounding lands.

The soils of the floodplain are generally river wash materials. The deposits underlying the floodplains and channels comprise the coarse, sandy materials laid down in stream beds and the finer, silty materials spread over the floodplains at times of high water.

The floodplain of the San Joaquin River is most distinct between Friant Dam and Road 20 where it crosses the dissected uplands and the low plains and alluvial fans on the east side of the valley. From Friant Dam downstream to where State Highway 41 crosses the river at Lanes Bridge, the width of the floodplain increases rapidly to more than a mile and then decreases to about a half a mile west of Highway 99 with trenching becoming less distinct toward the valley trough.

At a point where the river leaves the dissected upland, it begins to meander back and forth in wide arcs that encompass the entire width of the floodplain below the bluffs on either side. Toward the valley trough the floodplain narrows considerably and the meanders become smaller and turn in sharper arcs. In the wide parts of the floodplain, the river is braided and does not flow in any one single deepwater channel but splits into many shallower channels. Downstream from Lanes Bridge at Highway 41, the river banks

contain many natural levees which were built up by the deposition of large amounts of silting material during periods of flood. In some areas, these have been partially destroyed due to the widening of the present floodplain by the laterial erosion of the river. Extensive mining of sand and gravel materials has also modified this pattern.

The floodplain of the Chowchilla River is less than half a mile wide and is entrenched only about 40 feet below the upland level at a point where it leaves the Sierra Nevada. After passing on to the alluvial fan, the channels of the river become progressively less defined, both in depth and in width, and increase in braiding. Adjacent to the floodplain, between the Madera Canal and the City of Chowchilla, are very prominent natural leveel having relief in excess of 15 feet in many instances. Rainwater falling on these areas flows away from the river rather than to it.

The channel of the Fresno River is quite shallow, generally being less than ten feet below the level of the alluvial fan in its lower courses and less than fifty feet deep where it crosses the dissected uplands. The Fresno River, like the San Joaquin and the Chowchilla, has also developed natural levees on the adjacent alluvial fans to a point about six miles downstream from the City of Madera. Beyond that point, the channel is not as well defined in a natural way and is generally less than ten feet below the surrounding plains for several miles. Artificial diking contains the river in its lower reaches and, in some instances, has caused the bed of the river to rise above the level of the surrounding lands. This has the unfortunate effect of increasing the velocity of floodwaters flowing through any breaks in the dike rather than the more gentle sheet flowing that formerly took place over the natural dikes. Now, when these dikes are breached, the higher velocity of the water flowing from the elevated floodplain down to the adjoining lands often scours or gouges large trenches and thereafter deposits large amounts of blanketing silt in small areas. An overflow of the natural dikes before the artificial diking took place generally resulted in a more gentle flow of water and an almost immediate and widespread thin deposition of alluvial materials. Thus, well meaning efforts at flood prevention and land recovery adjoining the river have created a more dangerous river than was naturally the case before these "improvements" were made.

Other streams and rivers which dissect the floodplain include the Ash and Berenda Sloughs which branch out to the southwest from the Chowchilla River near the end of the Madera Canal. Cottonwood Creek leaves the main channel of the Fresno River about eleven miles northeast of Madera and traverses a major portion of the valley in a southwesterly direction in that area lying between the San Joaquin River and the Fresno River. Local history has it that Cottonwood Creek once was the main channel of the Fresno River but artificial diversion of the river by one of the first settlers in the area at a point just below the foothill line before the turn of the century sent the main stream down the Fresno and prevented it from flowing down the Cottonwood subsequently. Berenda, Daulton, Dry, Hildreth, Little Dry, and Root Creeks drain the lower foothills and central valley area of the County where precipitation is relatively light. However, local efforts to utilize larger areas for level irrigated agriculture have resulted in the partial filling and subsequent unnatural restriction of flow along portions of these streams in the irrigated areas of the valley. Consequently, many of these streams now flood from late winter and early spring rains because of these restrictions along the central areas of the stream systems. The conversion of some lands in the eastern portion of the valley to organized drainage systems in generally undeveloped subdivisions, as well as some new croplands with organized drainage, evolved from former grainlands and grazing areas has created a higher flash flood effect than in earlier times. On the earlier grazing and grainlands, levelling and organized drainage practices were not used. Rainwater, trapped by the vegetative cover and impeded by undeveloped drainage sank into the underground water table by penetrating the more friable areas along the fine patterns of northwest-southeast trending fractures, or at least penetrated several feet to the hardpan levels to recharge the shallow water supplies. Current changes to these older cultural practices and natural conditions have contributed to a change in the ability of the soils in these areas to impede the flow or to absorb the rainfalls as well as the system could in the past.

Presently, the major rivers are depositing very little alluvium and seem to be cutting downward on the upper reaches of their fans where the river floodplains are commonly entrenched to depths of 50 to 80 feet. Toward the lower ends of the fans, however, where the river gradients are lowest, many of the small streams and distributing flowages, particularly those of the Chowchilla and Fresno Rivers, are actively aggrading (or raising) their beds.

The overflow lands within the County are those areas in which the rivers spread out into numerous sloughs and which at times of highest flood under natural conditions have either been partly or wholly inundated. These lands are characterized on the geology map as Basin Deposţis of Recent Time, consisting of unconsolidated fine silty and clayey sand, silt, and clay.

The major rivers of the County have constructed natural levees on their banks along the major portion of their course through the valley. Along the San Joaquin River, these levees have been utilized in some places as foundations for man-made levees to control floods.

R.L.W.

Flood damage from shallow, sheet flooding such as this can be minimized by flood-proofing buildings and facilities. Such flood-proofing includes raising electrical equipment such as motors and switches above the usual shallow flood levels. In addition, raising vents to septic systems and adding check valves to sewer lines, as well as carefully sealing the upper portions of water wells can minimize the hazards and danger of such shallow flooding. In many areas of the County outside of the normal floodways of the streams and rivers, such practices can allow compatible agricultural uses while tolerating the flood waters which do have some value in bringing both useful water and rich silt materials to the land. Unfortunately, diking, chaneling, and closing in on some of the floodways within the County have created "monsters" which subsequently break out of the confines in high volumes and high velocities, causing scouring and mud or sand deposition on valuable agricultural lands in such concentrations that damage occurs. The former shallow sheet flows were certainly less destructive and possibly more beneficial to the land than the existing flood control system can now provide. This relationship indicates that a great amount of care should be taken in modifying natural systems unless and until the total long-range effects can be known

The overflow lands are very flat with low local relief and are generally poorly drained. The natural levees are the most prominent feature of the landscape and are a major influence in the direction of flow to both the trunk stream and the numerous tributaries. The Fresno River is a good example of a tributary whose course is influenced by natural levees along the San Joaquin River. On the west side of the County, natural levees along the San Joaquin River force the Fresno River to flow parallel to it for nearly 9 miles before allowing it to merge.

The soils of the overflow lands are quite heavy and poorly suited to intensive cultivation and as a result, most of these areas are used for the grazing of sheep and cattle.

Construction of two new dams in the County, one on the Chowchilla River and the other on the Fresno River, will have significant impact on the stream characteristics below. Flood control by means of these dams may minimize the necessity to artificially guide the remaining flows and to severely clear vegetation and wildlife habitat from all of the former floodplains in these streams. Some care toward saving some of the wildlife habitat and consequently minimizing the economic costs to the local community by taking less than the total vegetative cover from these floodways should be important considerations in this Open Space Plan.

THE FOOTHILLS OR DISSECTED UPLANDS

The foothills or dissected uplands are made up principally of dissected, old alluvial soils which have been cut through, over time, by the streams carrying runoff from the Sierra Nevada. Old terraces of former stream levels now lie well above the floodplains of the present streams. The area of the foothills or dissected uplands has an altitude of between 330 and two to three thousand feet above sea level. This area occupies a position some 14 to 18 miles wide between the Sierra Nevada and the alluvial plains and has a north-south dimension of around 24 miles. The topography here is diverse, ranging from gently rolling to steeply sloping hills. The relief can be considered to be over 10 feet throughout the area. The gently rolling hills are found in the lower elevations while the more precipitous terrain is found higher up toward the Sierra Nevada. In many areas, the smooth rolling landscape is broken by numerous outcrops of rock. This is particularly the case at the junction between the dissected upland and the alluvial plain of the valley.

The soils are commonly quite dense and compact, having zones of iron-silica cemented hardpan and having a hummocky or hog-wallow appearing surface. Grasses and oaks predominate in the foothills, with some areas having a dense growth of brush. Brushing is constantly carried out by ranchers who are grazing cattle in the area. Unfortunately, some of the "brushing" activities have prevented the introduction of new, young trees into the area and and thus the maturing trees in the area may be the last seen there as they age and die or are cut down for firewood.

Grazing is the major use made of the land, along with some scattered dry farmed grain.

The distribution of streams in the area is principally based upon an underlying pattern of fractures in the major rock structures where flowing water has been more successful in dissolving and moving the finer grained rock particles. Since these stream courses follow the general pattern of fracturing in these rocky areas, it is not surprising that principal groundwater supplies in these dissected uplands are principally found in wells drilled along these stream courses, into the fractured rock zone below. Of course, smaller groundwater supplies are found in other areas; however, these are generally limited to areas of deeper soils overlying rocks.

The lowest part of the foothills belt is cut on old, unconsolidated alluvial deposits, although some steeper hills and outlying hillocks reaching down to 380 feet display remnants of tertiary sedimentary strata and some younger metamorphic rocks. The tertiary sedimentary strata are continental conglomerates, sandstones, and mudstones, of the Ione formation and are usually seen exposed on east-west roads where the routes cut through the first line of low hills. An example of this can be found between Hildreth Creek and the Madera Canal, along Highway 145.

These remaining patches of sedimentary rocks form an interrupted narrow band across the edge of the foothills between the elevations of 400 feet and about 1,000 feet, characterized by the flat or table tops. These include Little Table Mountain, Adobe Hill, Daulton Hill, and other unnamed summits in line with these northwest of Daulton. New Daulton, a sandstone member of the Ione formation, has been quarried for years as flagstones and building stones. From the generalized geology map, the proportion of the County's surface covered with sedimentary rocks can be seen to be very small.

The metamorphic rocks of the foothills belt adjoining the sedimentary strata on the east extends southeastward across the County in a long wedge, tapering from about five miles in width in the vicinity of the Chowchilla River to about a mile in width near the Fresno River. In places, particularly southeast of the Fresno River, the metamorphic belt is greatly widened by adjoining areas of intermixed igneous and metamorphic rocks.

Areas at and near the contact of the intrusive granites and other igneous rocks with these metamorphics frequently show economic mineral and ore deposits. Thus along the eastern edge of the locality under discussion is found the foothill copper belt in the vicinity of Daulton and north of that point.

The remaining foothill area east of the metamorphic belt is composed primarily of granitic igneous rocks. If one consideres its elevation, (2360 ft to 2400 ft.) as included within the foothill area, then the surface of Kennedy Table represents yet another foothill rock type, volcanic lava of late Tertiary time. Thus, although all of the tables along the foothill line of Madera County look somewhat alike, the lower ones are composed of the remaining metamorphic orcks that underlie a former cover of lava while Kennedy Table still retains some of its lava cap.

The foothills are dissected by the same three major streams which flow through the alluvial fans and plains. The Chowchilla River is only slightly trenched into the upland surface and the Fresno River has cut into the uplands only about 50 feet. Both of these streams are of relatively minor importance if compared to the larger, year-round San Joaquin River. That river, the San Joaquin, below Friant Dam, has trenched about 150 feet below the general upland level. Relatively high and steep bluffs are a characteristic feature on both sides of the floodplain where the river has at some time cut into the adjacent hills.

Sierra Nevada

The mountainous portion of Madera County is a small and typical segment of the High Sierra Nevada. The Sierra Nevada is one of the most massive mountain ranges in North America, measuring about 430 miles long and between 40 and 80 miles wide. Many of the mountain peaks exceed 12,000 feet above sea leval, including a number in Madera County such as Mt. Ritter, Mt. Davis, Mt. Lyell, Mt. Florence, Banner Peak, Rodger Peak, and a few others: the entire skyline of Madera County's high country is dominated by the rugged peaks of Ritter, Banner, and the Minaret Range.

The general trend of the Sierra Nevada is slightly west of north, including that part of the range found in Madera County. There is a striking contrast between the east and west slopes of the range. The east slopes are very steeply inclined, while those on the west side of the crest are very gentle. Because of the unsymmetrical cross section, the crests of the high peaks lie only a few miles from the eastern boundary of the Sierra Nevada, but from 50 to 60 miles from the western base.

Surface rocks of the mountainous part of the County are largely granitic and other igneous rocks of the intruding batholith with large areas of metamorphosed older sedimentary and volcanic rocks of Tertiary and Quaternary age that lie upon these older rocks as a discontinuous surficial veneer. In addition, there are glacial deposits of Pleistocene Age in the higher mountains, and alluvial deposits of Quaternary Age underlying many upland meadows.

In geological terms, probably less is known or at least less has been written about the lower Sierra Nevada between the foothills and up to the Chiquita Ridge area. High interest was generated in this area's geology from 1849 until the middle 1920's when this area maintained its share of the large-scale gold mining activities of California. Recent geological maps and treatises indicate that although the sites of mines in this County were principally on the western sides of the larger hills and ridges, current geologists indicate that much larger and more concentrated gold deposits can be found buried on the eastern sides of these ridges in the same general areas. The shallower gold deposits were apparently detected by observing the piles of materials left by gophers and badgers in these areas and by shallow exploratory mining based upon an empirical extension of the earlier findings in the animal burrows. This more modern thesis by current geologists, of course, leads to some interesting speculation that gold resources of the County have not, perhaps, been totally exploited yet.

Much greater and more certain detail is available for the surface geology of the middle and high Sierra, including detailed geologic maps of two of the 1" = 1 mile quadrangles in that area. One of the more important features apparent on our generalized map of geology is the great concentrated area of metamorphic rocks in the vicinity of the Ritter Range. These are largely composed of intensely folded metamorphosed volcanic rocks. Consequently, the Ritter Range looms almost black above the light colored granitic rocks to the south and southwest. Practically all of the streams in the mountains run roughly at right angles to the general trend of the mountains; that is, they flow southwest on the western slopes. There are some exceptions such as the headwaters of the middle form of the San Joaquin River, Granite Creek, and Chiquita Creek which all parallel the crests of the peaks in older streamcourses.

Heavy concentration of precipitiation on the western slopes gives those streams a considerable volume, particularly during the spring runoff. Notable fluctuations can be seen in the flow due to the dry season during the summer and fall. Practically all of the major streams have eroded deep-sided canyons in the middle regions of the mountains. In some areas, such as the San Joaquin Gorge, the canyon is over 3,000 feet deep. The decreas-

ing rate of change of elevation of the mountains toward the west reduces the velocity of the water and the depth of the cut of the rivers.

The forested portion of the Sierra Nevada is that area below timberline which in many cases extends up to elevations of 10,000 feet. This portion of the mountains has many localized areas which are steep and rugged, but the majority of the area is not so precipitous. Practically all of the area contains some forest cover, interspersed throughout with grassy meadows, which provide some of the most delightful spots in the Sierra. In most cases, these meadows were once mountain lakes but have since filled with sediment and grown over with organic materials. It is also this zone that provides practically all of the commercial timber harvested, some summer grazing, and excellent high mountain recreational opportunities. Many public campgrounds can be found throughout the area up to the 7,000 foot elevation.

The topography of the barren, higher elevations is controlled in detail by glacial sculpture with the exception of Mt. Ritter, Banner Peak, and the sharp-pointed peaks of the Minarets which do not carry any signs of glacial polish but do exhibit it in the valleys and canyons lower down. Most of the hills are rounded knobs or domes of granite, practically devoid of soil. Among these hills the streams pick their way to the lower elevations, occasionally interruped by lakes and falls. These lakes and falls add immensely to the glory of the landscape and attract many people into the area during the short summers.

A few small, insignificant glaciers still survive, chiefly in the giant cirques at the flanks of the higher peaks. Many of the rocks in the bare regions still retain the striations and polish imparted by the glaciers. Post-glacial weathering and erosion erases most signs of glaciation with decreasing elevation.

This area has little value for forestry; however, there are some important mineral deposits found here. One of the area's most valuable assets is its winter snowfall. The runoff from the melting snow is indispensable to the agricultural economy of the valley below.

R.L.W.

Scenes like these in Madera's mountain region provide scenic beauty for local residents that is unrivaled anywhere in the world. Preservation of the forests and other vegetation that make up such an important part of this scene is a significant part of this Open Space Plan.

GROUND WATER QUALITY

The ground waters of the valley are characterized by marked differences in both chemical character and concentration in lateral and vertical distribution. These differences are related to differences in composition of the rocks in tributary drainage basins; to differences in climate both present and past; and to physical and chemical changes that have occurred after the water has reached the ground water body.

On the basis of areal differences, the ground waters may be subdivided, in quality, into two main groups: (a) ground waters of the eastern side of the valley which are generally of a bicarbonate type and of low to moderate mineral concentrations; (b) ground waters of the axial trough, which range greatly in chemical character and concentration but are usually of higher mineral concentration than the eastside waters.

The gound waters may also be subdivided roughly into three groups according to vertical differences in their quality; the unconfined and semi-confined waters, the confined waters, and the brackish and saline marine connate waters that underlie most of the valley. The chief difference between the unconfined and semi-confined waters and the underlying confined waters is that the lower, confined waters generally contain smaller quantities of dissolved mineral matter but a higher proportion of sodium than the overlying waters.

Beside depth to water, the quality must also be considered, for as wells are lowered to reach the receding water table, there is the possibility of tapping the saline water zones that deeply underlie some of this area.

The western portion of the County along the valley trough also has a quality problem. These low elevation lands are located where the depth to ground water is relatively shallow, permitting the water to rise to the surface by capillary action and evaporate, leaving behind a layer of salts; often referred to as alkali. Much of the ground water recharge is from the higher elevated lands to the east and this is usually so heavily laden with slats that that water on the west side is generally not usable.

Ground water in the valley is, for the most part, of good quality and suitable for the uses presently made of it. The natural quality of the ground water is determined by the character of the geologic formations through which it passes and, as such, may be considered beyond human control. However, where surface waters have been put to one use or another before they become ground water, or where the ground water is affected by well drilling or waste disposal practices, the changes in quality are within the scope of human control and concern. Deterioration of underground water can be actually more serious than that of surface waters. Movement of subterranean water is slow and is not subject to control as in the case of surface water.

Wastes discharged in cesspools, upon the ground, or into dry stream beds will usually pass slowly downward, aided by percolating rainfall, and, unless prevented from doing so by impervious strata, eventually reach and mix with the underground water. The effects of a harmful waste discharge may not become evident for years, or even decades, depending upon physical factors in the area, including such items as soil porosity, permeability, volume of flow, and presence of clay barriers. It may take as long or longer to correct any resulting damage as it did to bring it about in the first place. Damage to ground water wuality may result from over-use as well as from waste discharges into the ground water.

Over-pumping beyond the safe yield may cause intrusions of deeper salt waters to be drawn into the wells with resultant water quality deterioration.

The Madera Irrigation District and the Resources Council of Madera County have considered for some time the possibility of a purposeful and properly funded program for ground water recharge, using some of the surface waters available to the irrigation districts in the County. For some time, both the Chowchilla Water District and the Madera Irrigation District have carried out small uncompensated programs of ground water recharge, using surplus surface waters. Two probelms arise in this matter, however. First, land area is required for these ground water recharge basins. Secondly, operations necessary to create and maintain the basins as well as to transfer water to them, are costly to the irrigation districts. However, the users of the ground water are not regulated as to the amount they can take, nor do they pay any charge for withdrawing those ground waters.

Currently there is discussion ensuing in the County concerning the balance between continuing the traditional free withdrawal and suggestions to institute some form of regulation or fee to compensate the irrigation districts for the purposeful recharge of ground waters in this County. It is unclear at this time which philosophy will win out.

WATER IMPORTATION

At the present time there are no imports or exports of water either into or out of Madera County. However, there are several transfers of water from one drainage basin to another. The Madera Canal conveys water from Millerton Lake on the San Joaquin River to the Madera Irrigation District and to the Chowchilla Water District. In the strictist sense this cannot be considered imported water because deliveries by this canal involve transporting water from one drainage basin within the County to another.

Consideration is still being given to the proposed Eastside Canal which would bring water from northern sources to this area of the State. How much of that water would be available for local agriculture has not yet been determined or specified. There is some question as to whether much of the water would be available locally because the principal function of the canal and the proposed reservoir and pumping facilities in the Fig Garden rach of the San Joaquin River is part of a system designed to take water farther south.

FLOODS

With regard to floods and flood flows within Madera County, the San Joaquin River is fairly well controlled by Millerton Lake, and other major reservoirs on the river. The Fresno and Chowchilla Rivers are presently uncontrolled and excessive runoff presents the threat of floods to both the Chowchilla and Madera areas. The floods which do occur along the Chowchilla and Fresno Rivers result chiefly from rainfall in the season from November through April and are characterized by high peak flows of short duration. The majority of the flood damages are crop losses. Flooding of improved areas in the downstream reaches of the rivers generally occurs one or more times each year. Extensive flooding is estimated to average about once every 25 years, and extreme flooding about once in every 100 years. Silting of the river beds has generated the additional hazard of lessened flood water capacity, particularly in the Madera City area.

There is some danger that subsequent regulation of flood flows into the lower reaches of the rivers below the dams may result in further drastic widening of the bed of the river in its lower reaches, although depositional materials will almost likely be trapped in the still waters behind the dam, some material,transported from the upper reaches of the river below the dam to the lower reaches of the river by regulated water flow will almost certainly have the result of raising the bed of the river and making these lower reach areas even more floodplain in the distant future if specific practices or other corrective measures are not applied.

The recently authorized Buchanan and Hidden Reservoirs, however, will control floods on these two rivers. Flood flows onto the valley floor from smaller streams are not considered to be of great significance.

This chapter discussing the water resources of Madera County is primarily a brief resume of existing conditions. The California Department of Water Resources has recently completed an exhaustive study of the water situation in Madera County of a scope beyond the resources and abilities of the Madera County Planning Department. Therefore, the reader who wishes additional or more detailed information on Madera County's water resources is referred to that Department's recently completed, "Madera Area Investigation".*

OPEN SPACE FARMING AND GROUND WATER

The general concept that the provision of open space in a community will automatically generate a better environment for the almost automatic provision of more ground water is not a valid one. Thus we should understand some of the things that can go wrong with this concept that simply providing open space will improve the ground water situation.

All kinds of farming involve water use. Not all kinds of farming involve the kinds of water uses which generate new supplies of ground water. Generally, ripping, levelling, and surface irrigation will create a situation beneficial to putting additional supplies of water into the ground water reservoirs beneath such areas. On the other hand, the organization of drainage systems in areas formerly covered by "pot holes" may lead to a lessening of the introduction of water into the ground water reservoirs. Flood control programs often contribute to this negative impact on additional ground water supplies by safely and efficiently carrying waters that formerly spread over the land out of the region and into a master drain somewhere down below. New forms of irrigation such as the drip irrigation systems now being used on some of the newer orchards in Madera County tend to use not more water than is absolutely necessary for the growth of the plants and thus make no contribution to the ground water supply.

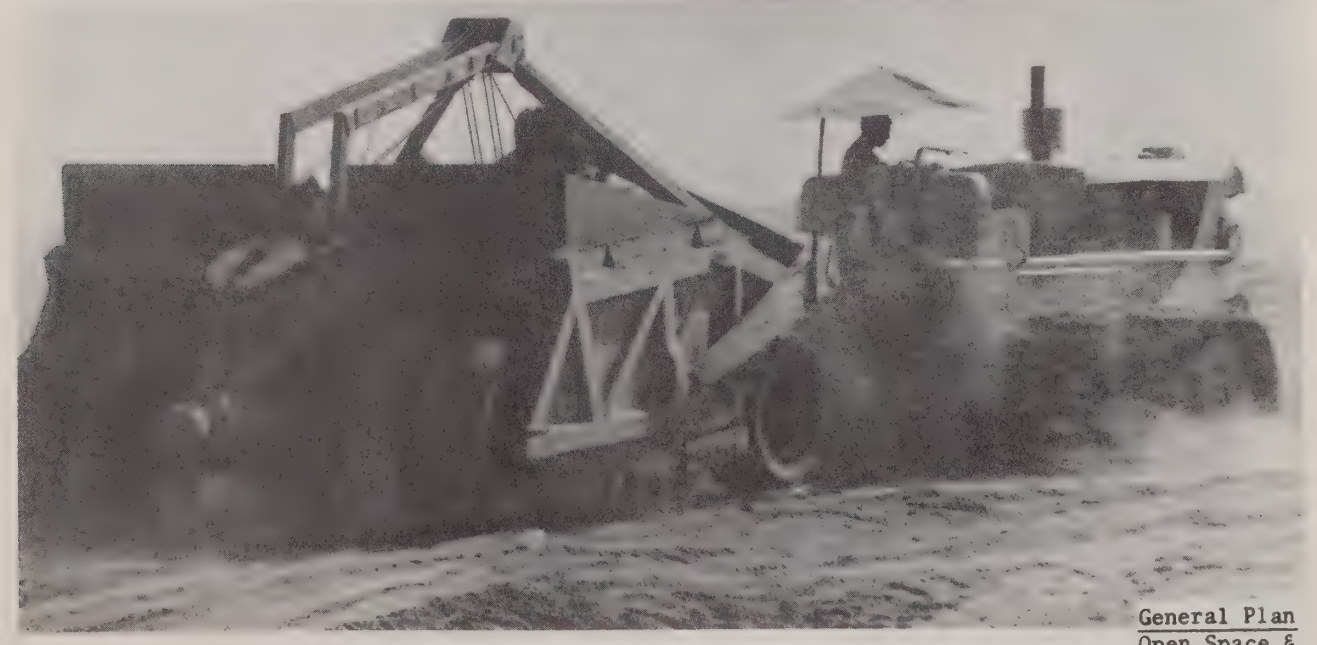
Thus it can be seen that the simple maintenance of agricultural enterprise over vast areas of this County does not automatically generate a situation which will automatically create a greater supply of ground water. For these reasons, care should be exercised in evaluating the pros and cons of agricultural land uses otherwise thought to be automatic providers of additional ground water as opposed to urban uses.

** California State Department of Water Resources, "Madera Area Investigation". Bulletin No. 135. April, 1966.*

Agricultural enterprise in Madera County is changing rapidly. This former "pothole" country has had its drainage pattern adjusted to eliminate potholes and new water is applied from deep wells by means of a modern drip irrigation system. The new irrigation technique provides little more than exactly enough water to grow the trees in this new orchard. Former contributions of water seeping into the underground from the potholes is virtually eliminated by the newly organized drainage system. Thus not all new agriculture will contribute to the improvement of water tables. Such new agricultural enterprise does, however, make a significant contribution to the local economy. This is part of 5½ square miles of newly planted pistachio nuts in Madera County.

R.L.W.

Land modification interrupts existing drainage patterns or opens up drainage patterns where none existed before. In addition, the raw lands create an extreme siltation hazard for downstream drainage facilities during the first few years subsequent to such modification activities. Care must be taken and understanding must be sought in terms of the possible impact on adjoining lands, drainage facilities, and groundwater that can result from these necessary activities. *P.O'R.*



P.O'R.

The canal systems of Madera County provide a significant opportunity for the development of recreational corridors. A principal drawback to their use involves liability to the current easement holders or land owners such as the Madera Irrigation District or the Chowchilla Water District. These public service organizations are understandably concerned about the possibility of liability when these canals and ditch banks are used for recreational corridor purposes. The management of these organizations has expressed an interest in cooperating toward the end of providing recreational or open space and scenic corridors providing the problems of liability and patrol for vandalism control can be worked out.

ECONOMIC BASE

Despite all of our wishes and hopes and policies to the contrary, the impact of the economic base of this County will probably do more to influence the choices made and the trends developed in terms of the consideration of open space in the future than any other factor. From the point of view of open space conservation, it is very fortunate that Madera County's economic base is principally founded upon agriculture and agriculturally related activities, upon forestry, and upon recreation. It is fortunate for the concept of open space preservation and conservation that almost one third of Madera County is owned or controlled by Federal agencies; nearly one third of the County is in public ownership. In a subsequent section dealing with land uses in Madera County, some details of the distribution of land ownership and control is expressed.

The analysis of the economy of Madera County may have many and varied uses for different persons and departments; however, here it is the purpose of this part of the report to relate the economic base to the potentials for open space and to understand how open space now relates to the economic base. The goal sought here is to achieve a basic understanding of the economy of the County in order to guide us to wise decisions in the General Plan and, more particularly, in this Open Space Element of the General Plan of Madera County and its several communities.

Throughout the study series leading to the General Plan of Madera County, we have been consistently reminded that each of these major study areas interacts with each of the others. Now in the study of the economy of the County, we can see more clearly the real relationships between how land is used, the Transportation and Circulation system, and how our fund of natural resources will apply to proposals for future land uses. We can see how open space is an important part of the existing economy and how we might insure that open space remains a part of our environment and our economy. What we can afford in the way of housing and even public facilities is related to how expensively or how inexpensively our land is used. One of the requirements of the General Plan was that we be in a position to do all we can to wisely relate the various factors in decisions that will, on the one hand, provide us with the kind of living and working environment that we seek and, on the other hand, be practical from an economic point of view. We may find in an analysis of the economic base the options as well as the reasons for open space.

Economic Growth

There is a general opinion that growth, and particularly industrial growth, is an unqualified index of progress in any community. Perhaps from the point of view of money and a strictly economic idea, rapid industrial growth is good for the economy. However, there is another point of view that must be considered. Some economists agree that such growth, (industrial growth), enriches us economically, but contend that it also often creates acute problems of requirements of land for our homes, for our recreation, and for driving and parking our cars, for more industry, and for many other kinds of land uses. In some cases, large disadvantages accrue from this kind of growth.

One economist calls these disadvantages "negative externalities" and defines this term as: the indirect consequences of economic transactions for individuals not in a position to be directly a party to those transactions. An example of a "negative externality" in the modern world is traffic congestion. When a man buys a car to drive to work instead of using a train or a bus, he is accepting the extra costs for himself, but inadvertently he imposes on other road users further costs arising from the slowing down of traffic, from the additional use of fuel, and through the additional probability of accidents. The other road users have no opportunity to directly prevent the over-sue of the road facilities and thereby affect the decision of the customer in question as to whether or not to buy the car, and so the problem builds.

Similar "externalities" arise regarding the availability of land for recreation, for agreeable residential sites, for agriculture, and for all other land use needs, including open space. The basic point of this argument is that some people in our community, or perhaps from outside of it, may take certain steps in the use or division of land which, in themselves, are completely legal and, one at a time, impose no real problem to the rest of us in the community. Yet over a period of time, the accumulated effect of these actions on the part of individuals making free choices generates a major economic problem for the community as a whole. Often these "negative externalities" are not recognized, or often them are recognized or either ignored or accepted as the "way of life", particularly when the negative aspects of the reaction will not occur for some time in the future.

Individual Actions - Joint Objectives

This analysis applies directly to the conservation of open space, for certainly each choice to structurally develop land formerly in agricultural, recreational, wetland, forest, or some other open space use, diminishes the open space total in the County. If the use is scattered or not contiguous to other non-open space uses, then it has an even greater negative impact.

It is one of the objectives of the General Plan and of this Open Space Element, for this community to consider the possibilities or potentials for such negative results arising from the day to day decisions that are now made, conjoined to the accumulated individual actions by people today, on the nature and character of the living, working, and recreation environment in the future. The General Plan for Open Space on the one hand must work with those trends which tend to achieve the goals of conserving open space and, on the other hand, recognize and attempt to avoid or to minimize the accumulative negative effects which tend to create a development pattern which is not what the people wish to have in terms of the conservation of open space.

REGIONAL INTERESTS

It is important to realize that, within the context of the County only, it may be that much more intensive development of certain areas of this County could be easily tolerated and still preserve a reasonable amount and kinds of open space. However, in terms of regional, State, and perhaps national needs, the gradual closing out of open space areas by other forms of land development may well be viewed as detriments to State or national policy. If that is the case, then we here would hope that those regional, State or national interests which are served would be able to economically participate in the costs of conserving those open spaces.

ECONOMIC HISTORY

The occupance of Madera County by western people began in about 1820. Trappers and explorers penetrated this region at that time. The Spanish occupants of California many years before that time had apparently avoided any significant occupance or even travel into this region of California. The gold rush of 1849 extended into the foothills of this area and in 1850 when gold was discovered in the mining region of the County, along the line approximately from Grub Gulch through Hildreth, an influx of miners began. Mining towns quickly sprang up, such as Coarsegold, Grub Gulch, Finegold, Cassidy's Bar, and Fresno Flats. In 1851, Major James Savage discovered the Yosemite Valley while pursuing some Indian people into the mountain area.

The local lumbering industry began in 1874 when William Thurmond organized a company to construct a lumber mill and built 64 miles of flumes to float the lumber to a rail head at Madera from the mountain community of Sugar Pine. The Central Pacific Railroad had been completed through the San Joaquin Valley in 1873. The partial milling and transfer of the lumber from the flume to the railroad generated the City of Madera and incidentally, almost obliterated the community of Borden which, prior to that time, had seemed destined to become the principal urban center of this County and was for a short time the County seat.

Madera County was formed in 1893 from a part of Fresno County and the City of Madera was established as the County Seat. Serious agricultural activities in this region started about 100 years ago when a group of settlers from Alabama aquired land and began farming a few thousand acres southwest of the present location of the City of Madera. That area is now the heart of intensified agricultural activities in the County and is principally utilized for vineyards, orchards, and cotton. Irrigation of agricultural land in Madera County began in 1871. In 1963, there were 172,000 acres of irrigated farmland. This increased by 1967 to 22,085 acres in the Madera and Chowchilla irrigation districts. Much additional land is under irrigation in areas outside the boundaries of these two irrigation districts where ground water is used. The proposed Eastside Canal could very well double the amount of land under surface irrigation in this County within a decade after its completion.

Ecomomic History of Chowchilla

The City of Chowchilla was founded in 1912 by Orlando O. Robertson, President of the United States Farm Company. Mr. Robertson divided farm tracts for sale from the huge Chowchilla Ranch of 108,000 acres. The City of Chowchilla was incorporated in 1923 and now serves as the trading center for the northern part of Madera County in the valley, as well as for a part of the southern region of Merced County.

Economic History of Madera

The City of Madera began in 1875 when William Thurmond's water flume was completed to the railhead. Madera was incorporated in 1906 and now serves as the shopping and service center for the central and southern portion of Madera County in the valley. It is the County Seat. The Mexican and Oregon borders are equidistant north and south from this place and the Nevada State line and Pacific Ocean are equidistant on the east and west line. The City of Madera is 99 miles south of the seaport terminal in Stockton. The center of the County lies 240 miles northeast of Los Angeles and 166 miles southeast of San Francisco.

Madera and Chowchilla are 16 miles apart. Both of these incorporated cities are on Highway 99, a principal highway link between northern and southern California. Highway 145 enters Madera County on the south, crosses through the City of Madera, and turns directly to the east, providing access from the City of Madera directly to Highway 41 and to Yosemite National Park and other High Sierra recreational areas. Highway 152, directly from Coast areas through Los Banos, intersects Highway 99 just south of Chowchilla. It extends to the west, providing easy access to the Santa Clara Valley and runs between the Coast Ranges to San Francisco and Oakland. Highway 152 also is a principal access to U.S. 5 Freeway, just west of Los Banos. It is proposed to extend Highway 152 to the east to intersect with Highway 41 and provide direct access from the Coast regions to Yosemite National Park and other High Sierra recreation areas.

Employment

Some employment gains have been the result of the introduction of new winery facilities and a glass bottling plant and a box plant, as well as a plant manufacturing heat exchange devices. New employment gains can be expected from the temporary influx of construction workers to build two new dams in Madera County over the next few years. A number of new recreational activities in the mountain areas have boosted employment for unskilled persons in those activities and the service related functions that provide food and lodging for people coming to the mountain area for that recreation. A new plant, manufacturing chip board from waste wood products, and a new lumber mill and storage facility are two other resource-related industries recently introduced into Madera County which are currently increasing the number of persons in non-agricultural employment here.

There was a steady low in agricultural employment in Madera County over the past decade. Average agricultural unemployment has recently been greater than 10% and as much as 12% at times. A past 6 year average of unemployment hovers around 10%. A number of unskilled agricultural workers have tended to move away from the Madera region while persons skilled in tractor and equipment operation and maintenance have increased in numbers here. This is commensurate with the gradual changeover from agricultural operations using large numbers of people to carry out more mechanically oriented, larger scale and sometimes corporate farm operations. An example of the latter trend can be seen in the recent development of over 5½ square miles of pistachio nuts in one agricultural development here recently. This operation sells individual parcels of property from 20 to 40 acres in size to individual investors and then maintains and operates the farming enterprise as a management group for the conglomerate of individual parcel owners.

Industrial Development

Madera County and its two incorporated cities of Madera and Chowchilla now maintain an active and well-funded Industrial Development Commission whose basic written policy is to bring new agriculturally-related industry to Madera County. However, there is a general opinion among the business communities that any new industry would be good for business in terms of bringing in more people.

Income

Per capita income of the residents of Madera County is considerably below that of California as a whole. Wages and salaries are the largest single source of personal income in the County, counting for a little less than half of the total. The agricultural character of the area is reflected in the proprieter's income which comes next, (about one third). Property income and transfer payments contribute about ten percent to the total personal income of the County. As might be expected from the lower personal income of the County, the median family income of under $5,000 is about 15% below the State's median.

Future Basic Income from Agriculture

It seems certain that, barring the introduction of some unexpected, particularly large new manufacturing industry, agriculture will continue to be the basic income producer for this County for many years to come. There is a probability of more than doubling irrigated acreage in the County and at present prices, this would generate a basic income of more than 150 million dollars annually.

This new agricultural growth will produce an increasing need for canneries, packing sheds, cold storage buildings, warehouses, and other affiliated business and industry opportunities. The local political climate is decidedly favorable for the continued development of agricultur in the County and for its conversion to intensified agricultural activities, as well as the inclusion of new agriculturally-related industries.

A serious problem remains as a result of undeveloped, speculative residential subdivisions pulling some agriculturally-suitable land out of the possibility of production. In addition, this overdevelopment of subdivision lands, particularly in the valley portion of the County, generates an exotic, real-estate oriented assessed valuation upon adjoining agricultural and potentially agricultural lands.

LAND CONSERVATION ACT

The intervention of the Williamson Act to provide tax stabilization to agricultural lands in agricultural preserves has resulted in nearly 380,000 acres of principally cattle range and more lately vineyard and cotton lands being put into these agricultural preserves and thus removed from the immediate possibility of division into massive, unused subdivisions. The County is currently engaged in a program of contract agreements under the Williamson Act to include virtually all agricultural lands that are requested by property owners to be put into the agricultural preserves.

The Williamson Act requires that the local County Assessor appraise agricultural lands for tax purposes in terms of their ability to produce an agricultural product rather than in terms of their speculative or potential value for other uses such as subdivisions or commercial or industrial uses. In return for what usually is a lower tax bill resulting from this method of appraisal, the landowner agrees by contract not to divide his property for sale as split lots or subdivision or to use it for non-agricultural purposes for a period of ten years. If he does not take specific action to terminate his contract with the County ten years hence, the contract or agreement automatically is extended for another year each year. Thus the map of lands under Williamson Act agricultural contracts and agreements is an expression of a ten year open space plan in terms of agricultural preserve lands.

Other kinds of lands, including some flat, wetlands, game preserves, and forests are also eligible under the State law to be included. At this time, some wetlands and some forest land is included in contract or agreement areas in Madera County, however, listed as agricultural land without differentiation from agricultural open space land uses.

The impact of some of the over speculative residential subdivisions on the local economy was recently investigated and reported on by Jane Moran, sponsored by the Department of Soil Conservation of the State of California.(1) In general, Miss Moran's conclusions indicated that such subdividing practices were not economically advantageous to the local County in terms of long range costs and benefits.

(1). *Moran, Jane. "Economic Impact Study of the Effects of Alternate Forms of Land Development on a Rural Area", Resources Agency of California, Dept. of Conservation, Division of Soil Conservation. Sept. 1971.*

An example of one specific problem with such speculative subdividing can be seen in an analysis of an area subdivided north of the City of Madera over eleven years ago. There, an area one and one half times the size of the existing City of Madera was subdivided and zoned for various purposes, including industrial and principally multiple family uses. No public land was dedicated for any purpose, including parks, playgrounds, schools, fire or police services, or any other public service. Thus any open space needed in the future in that place, one and one half times the size of the City of Madera and zoned mostly for apartment use, will have to be provided through the mechanism of public expenditure to acquire the land. Although little current housing development is taking place on these properties, and although current health laws require a maximum density of one dwelling to the acre, there appears to be a belated concensus of local opinion that the developer should have provided some open space lands for use as sites for public facilities and recreation areas. On the other hand, local government does not wish to have such lands offered for dedication and accepted because of the negative impact on the local tax rolls. Opponents of that opinion suggest that adjoining properties would appreciate in value from the availability of public lands for open space uses in the subdivision to such an extent that the increased assessments on those adjoining lots would offset the tax revenue loss from the dedication. In view of the almost total lack of development of housing in the area, the arguments are currently theoretical.

Long Range Considerations

Long range survival of agriculture as a basic industry in Madera County will almost certainly rest upon the outcome of competition for land areas to an extent modified by local zoning and the workings of the Williamson Act to generate land preserves through agreements and contracts. Recent announcements by State and Federal agencies indicates that perhaps if local communities fail to preserve open space uses, then State or Federal programs might be brought to bear such as the State of Hawaii system of zoning lands for either agriculture or urban development. In either case, whether under local control according to a plan for open space or under State or Federal requirements to reserve certain areas for agricultural or other open land uses, this Open Space Element of the General Plan should be of value to Madera County.

New Business Location

A popular misconception about service industries and businesses is that the introduction of these businesses and industries into the community will, of themselves, generate the business to use their services. Generally economists do not agree with this conception of the service businesses and industries, but rather, emphasize the importance of generating new basic income to the community, after which the service functions will develop quickly from among those with initiative in the business community.

Increases in recreational activities in our mountain region have provided accompanying increases in service establishments and employment in service establishments in those areas. Further attractions for recreation-oriented people entering the County will provide further expansion of these activities and this employment.

The growth of other service establishments not oriented to the recreation industry or to the touring public along the major highways appear to grow in direct correlation with the per capita personal income of the County. Thus, any increase in wages or available jobs to people of Madera County will certainly be multiplied in their effects in the service functions of our commercial activities.

A beautification and clean-up program along the major entrances to the City of Madera could create benefits and increasing service sales to the touring public utilizing Highway 99. Similar efforts by mountain groups, particularly in the Oakhurst area, should contribute much to the preservation and promotion of service industries and businesses in that region.

Gross Adjusted Income

Madera County was on the bottom of the list of gross adjusted income of the State of California for several years in the past. However, this position has been garned by another county at this time. The gross adjusted income in this County is still quite low. A low gross adjusted income average for a community or a region is typical when the basic industry is agricultural. From the point of view of preserving the open space, this can have both positive and negative effects. From the positive point of view, a low gross adjusted income and per capita income, for that matter, will tend to discourage the influx of new people to jobs in this area. The relatively high unemployment rate also generates this kind of restraint on new employees moving into this area. This, of course, is offset by the influx of persons who are retiring from jobs elsewhere in the State and are seeking a quiet and rural setting for their retirement, and an influx of those persons whose skills are necessary in some of the more mechanically-oriented, newer agriculturally related industries. It is interesting to note also that certain practices of welfare payments in the State of California tend to make Madera County more desirable than some others, where certain fixed amounts are provided for some categories of welfare aid and, commensurate with the lower gross adjusted income and per capita income, some prices included in the cost of living are lower than they are elsewhere in more urban areas. Thus the welfare dollar goes further here than it can go in a more urban area. It is unfortunate that this aspect of the relationship between some of the more evenly distributed welfare funds and the low economic position of this County should tend to generate an even higher load on what appears to be a now overloaded program of welfare support here.

BASIC INCOME GENERATORS

Agriculture

Agriculture provides the bulk of basic income to Madera County and the agriculturally related services and industries account for most of the service activities of the County. Thus the measure of agricultural production is a critical indicator of the economic well being of the community. In the valley portion of Madera County, agriculture functions as a basic industry. It is literally an industry without a roof.

Of course, the agricultural economy rises and falls with the event of crop damage due to inclement weather, including low temperatures, winds, hail, too much or too little rain, and certain relationships between plants and the temperature regime.

Average farm size is increasing in Madera County as it is in most other agricultural areas. Land in farms, cropland, and under irrigation is also increasing. Farm investment has more than doubled in the last decade. However, the number of farms is rapidly declining, indicating a shift to fewer but larger farms. Many of these farms are now going into corporate ownership and management, while others, remaining in private ownership, are heavily financed by major financial institutions and all such very nearly represent corporate investment in agriculture while the former owner becomes more and more a manager of someone else's investment.

Not all increases in agricultural production yield clear basic income. Offsetting some of the basic income-producing capabilities of agriculture here were expenditures by local producers for gasoline and oil; more than two million dollars worth. This and other money for specialized equipment constructed outside of this County and some special services goes out of the County for those goods and services and thus reduces the net basic income figure.

Probably the most significant thing about agriculture as a basic income producer for a community is that it tends to increase in income-producing ability at a slower rate than some other kinds of industries. Therefore, it should not be surprising that where the national economy is increasing at rates of 5% to 7% and recently even greater percentages, local economic indicators show that the local economy is increasing at less than 2%. Since the basic income is the prime motivating force of its economy, it should be obvious that County government, financed as it is by taxes on values of land and improvements, (the capitalization of which comes in part from local basic income), can look forward only to a significantly poorer relative position among counties in this urbanizing state. It seems clear, then, that certain courses of action will have to be taken if there is any concensus for profiding significant increases in basic income for the County. As with many other basic income producing economic activities, it is often outside factors, (outside the community's production), in fact international factors, which create the significant trends. It appears necessary that agriculture itself will have to intensify its productive capabilities, increase its efficiency, and in all ways attempt to increase its basic productivity here. It would appear from this analysis that it is very important to preserve the Class 1 and Class 2, and perhaps Class 3 soils of the County for the increased and more intensive production of agricultural goods in the future. The prevention of the substitution of urban and other kinds of non-agricultural uses on Class 1 and Class 2 soils when other soil types are reasonable available for such development should become a basic part of the Open Space Plan.

Regarding the need for an increase in efficiency and an increase in basic productivity, some evidence can be seen that this change is in progress through both extensive and intensive changes in agricultural use on the western side of the County and in the increasing use of fertilizers and special techniques for increased productivity on rangelands. There have also been some minor trends in agricultural use intensification in the substitution of higher valued crops, (on a per-acre basis), for the more extensively grown crops.

Land

Land should be considered in two principal categories; first as the space upon which human activity takes place and second, the material of which it is made; the soils on the landforms. The mountains of Madera County are the source of our soils and our water, as well as our principal mineral formations. Nearly one half of this County lies in a region properly called, "Mountainous". Another third of the County is covered by dissected uplands or foothills. Lands not now used for intensive agriculture constitute about one quarter of the area of the County and are designated "low alluvial plains and fans". "Recent overflow lands" constitute a smaller portion of the west side of the County. Many of these places are currently under development as agricultural lands at this time. The river floodplains and channels are confined to the stream channel areas of the San Joaquin River and the Fresno River, the Chowchilla River and Ash Slough.

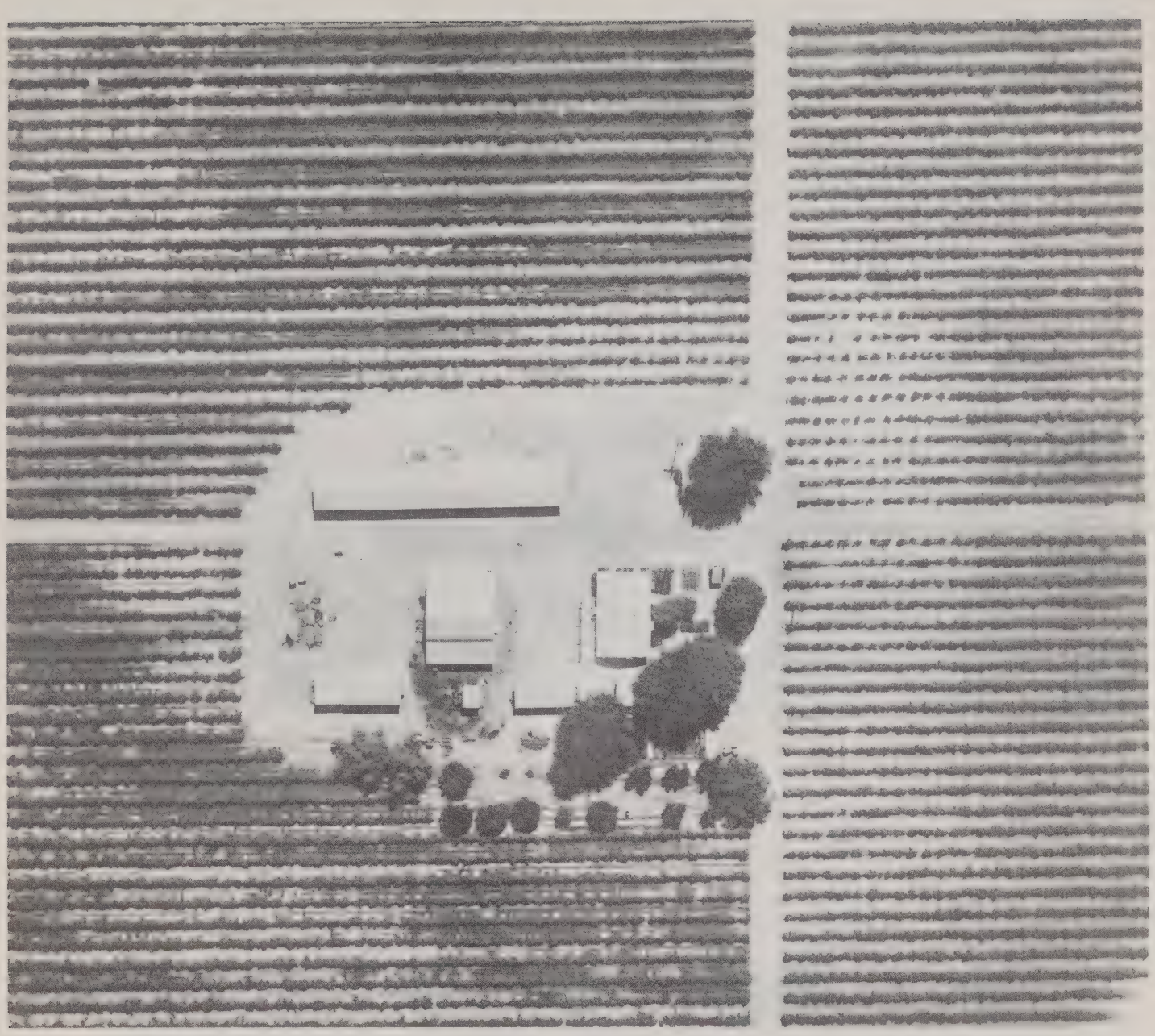
Probably the most significant fact about soil distribution and landforms in the County is that the best soils and those most suitable for intensive agriculture because of their level nature and absence of surface rock are located in the valley portion of the County. They are located in the area where urbanization and suburbanization is proceeding most rapidly and they are not replaceable by soils or landforms elsewhere in the County. Specific data and very precise maps about soils are provided in the Soil Conservation Services study entitled, "Soils, Madera County, California".

A principal problem for adequate water supplies in the future evolves from the currently extensive use of septic systems for sewage disposal. The substitution of adequate public sewage systems using aeration and digester methods is anticipated to be needed as land occupancy intensifies in certain nodal areas in the County.

An Ad Hoc Drainage Committee has recommended to the Board of Supervisors that the County develop a Drainage Study and Plan under an H.U.D. 701 Project proposal.

Power

Madera County's electic supply comes from Pacific Gas and Electric transmission and distribution system with a network of lines that serves the entire County. In the company's Crane Valley system in the mountains of Eastern Madera County are located a series of hydroelectric plants which generate power for general use throughout the entire P.G. & E. territory. New major power line routes through the valley are proposed by P.G. & E. in the near future. These will intertie power supplies with those generated in the northern part of the State in the near future. New and existing right of ways may provide trail or corridor open space opportunities.



R.L.W.

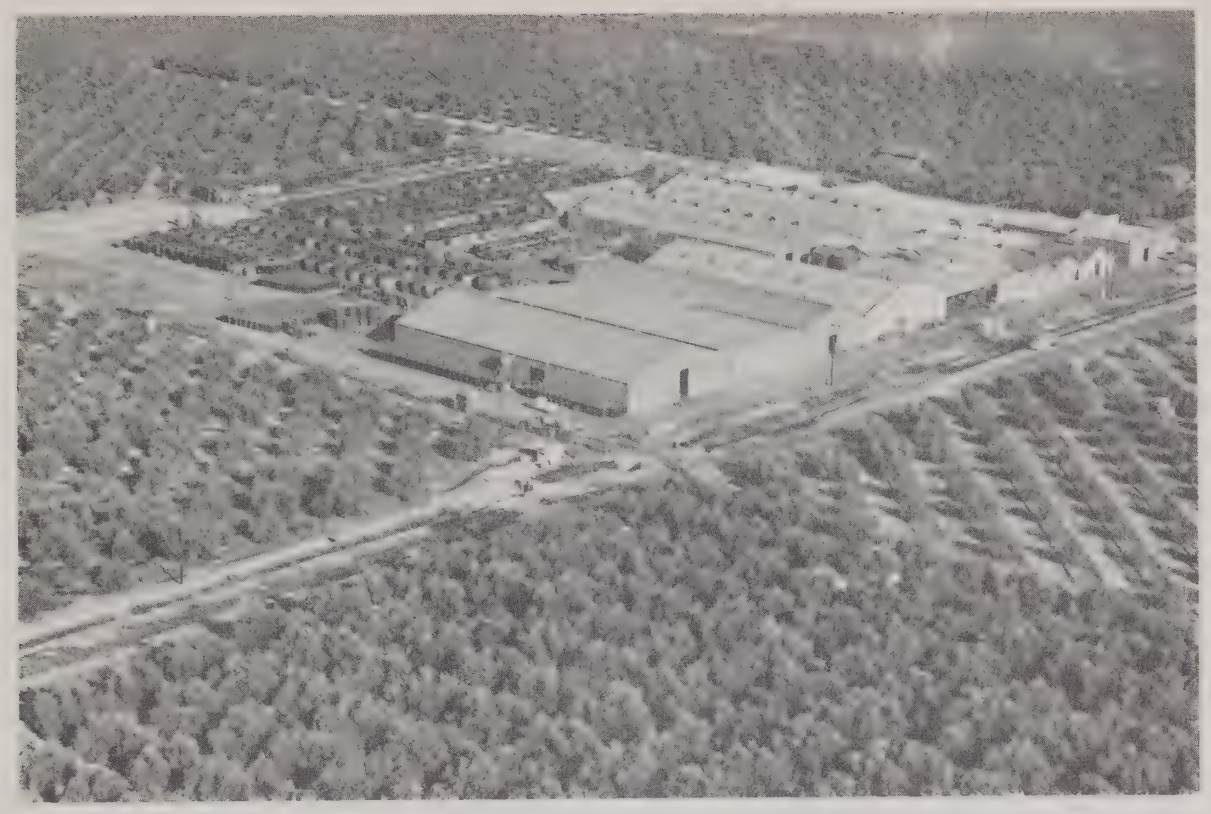
Vast open areas in agricultural use occupy more than half of the total agriculturally-used lands in Madera County. Nearly 95% of the land outside of the National Forest, National Park, and National Wilderness Area is in agricultural use, including grazing. Farms are becoming larger in size and fewer in number in this place as well as in most counties in the United States. Many former rural dwelling farm managers and owners are moving to the city while managing agricultural activities in the hinterland.

P.O'R.

Not all agricultural enterprise has the appearance of plain open space. This intensive animal agricultural operation utilizes techniques, equipment, organization, and capitalization nearly identical to any large corporate manufacturing enterprise. The dispersal of such intensive animal agricultural activities throughout large areas of open space is an important consideration in local land use policies. Open space in such an instance provides for a natural ability to diffuse and to dissipate potential pollution factors emanating from such intensive land uses.

The importance of agriculture to the local economy of this County cannot be overemphasized. It provides the basis for the critical income of nearly three quarters of the population of Madera County and underlies nearly all other economic activities other than recreation here.

P.O'R.



Areas of intensive agriculturally related industrial use are interspersed in the agricultural growing areas of the County. These kinds of industry are very necessary and provision for them has been made in the General Plan and in the Zoning Ordinance. They are an effective contributor to the economic wellbeing of agriculture which, in turn, is the principal contributor to the conservation of open space in this County.

Agriculture is making increasing use of highly mechanized devices in nearly all local operations. This cotton picking machine requires a highly trained person to operate and to maintain it. It costs tens of thousands of dollars and utilizes exotic materials and extremely sophisticated advanced mechanical technology. The use of such equipment causes a lower demand for hand labor; however, the expanding agricultural economy has apparently balanced the loss of need for hand labor with an increasing need for skilled and trained labor, thus leading to an approximately balanced population trend in the County over the past decade. Open space is needed for the evaporative dispersal of water effluent from this olive packing operation. Thus open space performs an exceptionally valuable

R.L.W.

This composite photo illustrates one of the uncompensated costs of open space to the local community. Air and ground search operations for downed aircraft, lost persons, missing or injured hunters, stranded vehicles including cars, trucks and snow-mobiles are expensive functions not now paid for by other than local taxes or contributions by private search and rescue groups. Federal or statewide compensation for these expensive services is needed as part of the Open Space Program.

Sewer Services

The City of Madera is currently in the process of completing a new, enlarged sewer system and treatment plant capable of handling approximately three times the current sewage generated here. The new processing plant has been located nearly three miles southwest of the City. Unfortunately for the concept of preserving Class 1 lands, the intervening space between the sewage plant and the City is principally in Class 1 soils. It is the stated policy of the City to develop those lands for residential and industrial purposes.

The City of Chowchilla has recently completed a new, enlarged plant capable of handling some planned new industrial development in an industrial airpark immediately south of the City. The community of Oakhurst has recently completed a sewage plant and collection system for the core area of the Oakhurst community. A sewage collection and treatment plant was completed in North Fork approximately four years ago and most residents within reach of the collection system have now attached to the lines. An unfortunate lack of planning on the part of the engineers who designed the facility at North Fork has resulted in two expensive floods of that facility there. An old subdivision immediately across the stream, (Willow Creek), from the sewage plant many years ago generated some lots which extend into and, in some cases, across the stream bed. Users of these lots, intent upon protecting their developments on those parcels, have expressed their intention to fill, partially fill, or dike part of the Willow Creek. This can only lead to an intensification of the flood hazard in the sewer plant on the opposite bank. That old subdivision did not provide sufficient space for a floodway in its initial design and development stages many years ago. However, it does represent an example of why public open space or open space areas should be generated at the time of initial development of subdivisions in order to preclude future flooding problems to both private and public facilities in the future.

Travel and Recreation

Within 50 miles of the City of Madera and Highway 99 begins the forested, mountainous part of the County, reaching some 40 miles eastward through areas of superb natural beauty. The many recreational features offered by the County include hunting, fishing, boating, camping, picnicking, skiing, wilderness trips, or simply sight-seeing and relaxing. Most people in the County participate in some of these activities at some time. However, the majority of persons engaging in these activities in the County are from outside of the County.

Yosemite National Park

Tourists from every state in the nation and from abroad travel Highway 41, known as the Yosemite Discovery Route, often via Highway 145 and the City of Madera, into the spectacular scenic areas of Yosemite National Park. Nearly 78,000 acres of the park lie in Madera County and include a portion of the high, majestic wilderness area in the far eastern part of the County. Although new plans and some extreme measures have been taken by the National Park Service to minimize the impact of motor vehicles and large numbers of people on the valley floor at Yosemite National Park, many of the higher areas outside of the valley within the National Park are lightly used at this time.

The park's south entrance station is only 56 miles northeast of the City of Madera. The area offers a variety of choices for all year outdoor recreation. Many motel and resort accommodations are available along Highway 41 via the historic communities of Coarsegold and Oakhurst.

Along this route are two new recreationally-oriented facilities. One of these is a steam railroad located near Sugar Pine. The second new facility is a 274 acre outdoor zoo called "Safari World". Currently at that place there are 42 species of animals and more than 200 African animals on display in open areas where people travel among them in automobiles or closed vans. A significant objective of that zoo is the perpetuation of some internationally endangered wildlife species. Thus a local, tourist-oriented industry is derived from an international need.

Hazards of Open Space

Despite the positive aspects of the provision of open space within a community or region, there are some hazards that must be recognized and prepared for. The sheer presence of large areas of open space create hazards for persons who may become lost in such areas. A combination of injury and becoming lost can be a very real hazard to persons in these open space areas. In regions like Madera County with much of its open space in the rocky, steep slope, heavily forested areas and very extensive, broad flat lands, such hazards are very real. A simple flat tire or a broken radiator hose can initiate serious consequences in such large, broad open areas. Rattlesnakes are a minor hazard, but combined with distance to medical help, can become very serious. Falls and water-related accidents also take on greater hazard in these gross open areas.

Because of these special hazards, special techniques are utilized by local public safety persons to patrol and provide search and rescue facilities to cover these areas. It has been recognized in Madera County that the provision of such search and rescue services in these large open areas is a relatively expensive process in terms of the available tax base to pay for these services. A local economic hazard is in effect in such cases. The cost of search and rescue operations in some cases here has exceeded $10,000 for one incident. The high proportion of incidents occurring in Madera County involve persons from other counties, principally the metropolitan areas of the State. It has been suggested that the cost of search and rescue operations in the remote areas of these less developed counties be assured by the county of origin of the person or persons involved in an incident where persons become lost, or injured and lost, in these vast areas. Legislation was introduced in the spring of 1972 in an attempt to bring about this kind of recompensation to the local community. Whether compensation is provided or not, public protection services must be made available to open space areas and should be planned for.

OPEN SPACE DEDICATIONS

Existing Road Dedication Process

During the past several years, Madera County has devised a rather unique system for progressive dedication and improvement of the roads necessary to provide eventual public access to newly dividing lands in minor subdivisions or in other terms, "lot splits". This dedication and improvement process recognizes the long-term over which subsequent events leading to eventual completed road and drainage systems will occur. It is an attempt on the part of the County to fairly spread the cost of road right of way provision and the cost of improvement of that road and drainage system over the broadest possible base; that is, among the greatest number of eventual land owners in that place. In some respects it functions somewhat like a minor road district with each subsequent participant in the land division process in that area making his proportionate contribution to the total development cost.

Typically, the system works like this: the initial divider of land in a particular area is required to provide a minimum 60 ft. right of way offer of dedication to the County. This offer of dedication is recorded in the County Recorder's office as a bona fide, binding offer of dedication of that right of way. But it is not accepted by the Board of Supervisors at that time. Concurrently, an easement is made which allows subsequent land buyers in that area to utilize that right of way area as an easement to their properties while the offer of dedication lies dormant in the Recorder's files. The next person entering the system by filing a parcel map to further divide lands in this same area is required by the Road Department, (for the approval of such parcel maps), to initiate the basic construction of the road, perhaps by installing culverts and subdrainage facilities or by providing the road base to County standards. Subsequent owners are then required, upon the filing of their parcel maps in the same area, to provide road surfacing in such a way that the cost is spread among several dividers and subsequent owners in the area. Ideally, when the system is completed, a County standard road serves all the parcels in that area and each person participating in the land division process along the way has made his proportionate contribution to the cost.

Possible Open Space Dedication Process

This rather detailed dissertation on the system by which roads are offered and constructed in Madera County's minor subdivision or parcel mapping process is presented to indicate a possible means of handling dedications of open space at an early time in the development process of any area. A comparison of the road dedication improvement system with the needs of open space dedication and possible improvement of access or certain enhancement of the open space areas should be reviewed. The developer of any significant land division or major construction project in the County where open space is required according to the General Plan Element for Open Space or specific plans for that area can offer for dedication such open space areas. These offers of dedication may then be recorded in the County Recorder's office but, like the road dedications, not accepted by the Board of Supervisors at that time. This has the value to the County of keeping such areas of land on the tax rolls. The continuing owner of the property would be afforded the opportunity to use the land in an open space fasion without other restriction. That dedicated land simply could not be built upon or developed other than in an open space use as the rest of the development is being completed. As the development was completed and the need for the open space became more pressing in terms of a recreational area or simply open land for other public purposes in the area, the County Board of Supervisors could determine at that later time to accept the offer of dedication and make the property a public land use. Such offers of dedication would probably not be accepted by future Boards of Supervisors until the positive impact on surrounding lots would yield a tax offset to cover the withdrawal of the open space from the tax rolls. It should be pointed out at such a time that the value impact of an open space on adjoining residential property, for example, could very well boost the values of these adjoining lots enough that a net tax yield increase would be experienced from such a procedure.

LAND USE AND OPEN SPACE

Introduction

Obviously the most significant relationship in this Study and Plan for Open Space is the relationship between land use and open space in Madera County. During the course of the preparation of materials leading to a General Plan of Madera County recently, the Land Use Study was prepared. That Land Use Study explored existing land uses, land use controls, and land use trends and relationships. Some of these land use factors are reiterated here, and additional information concerning recent trends and changes in land use have been included.

History of Land Uses

The history of significant changes in land use began a little more than a century ago when in about 1850 the influx of gold seekers began. The rise in population created a demand for meat, and cattle raising began in the valley. The demand for cattle increased the demand for grain as food for the cattle and flour for the mining camps, and grain farming began. In 1868, vast acreages of land in the valley were planted to wheat. The wheat land acreages were principally located from the highwlands between the drainage streams and on the higher elevations of the valley, must below the foothills in the rolling country.

More permanent occupance of the land began in 1873 when railroad connections in the valley made it possible to obtain goods from the major commercial centers of the State and to sell products grown here to those places. Changes in economic pressures and continuing population increase began to dissolve and break up the large cattle and grain land ranches. There were four principal reasons helping to terminate the extensive cattle ranches: overstocking of the range, droughts, a drop in prices, and the passage of the "No Fence Act". The "No Fence Act" meant farmers were not required to fence their land and cattlemen would be held responsible for damages done by their stock. The cattle ranchers either had to fence their land or hire enough cowboys to herd the stock day and night.

After 1874, agriculture began to diversify and a number of agricultural colonies were begun in the San Joaquin Valley. Two of the best known colonies established here were the John Brown Colony and the Alabama Colony. Both of these colonies were located on land formerly owned by Friedlander and Chapman, the originators of the early wheatland operations. These colonies initially engaged in wheat farming but gradually diversified. Early irrigation projects developed in parallel with the diversified agriculture. At first the introduction of irrigation waters in some of these areas ruined them by bringing alkali to the surface and much land, particularly on the far west side of the County, was abandoned after a few years of farming because of the alkali pollution. Orchards and vineyards were introduced about 1880, and grew essentially parallel with the development of irrigation, although the production of wheat was the dominant agricultural economic base here until about 1910. The larger, more recent and more efficient irrigation systems using waters of the Friant Dam and delivered by the Madera canal have allowed a significant increase in production of diversified crops.

It is anticipated that new irrigation waters such as those possibly to be provided by the Eastside Canal should continue to allow more extensive areas to be put into these intensive and diversified agricultura uses. Today a number of new diversified agricultural areas are coming into production, utilizing only the groundwater available on the east side of the valley above the irrigation system's capability to deliver surface water. A continuing decline in the ground water availability in some of these east side areas portends a future economic problem if the East Side Canal waters are not, in fact, provided as substitute supplies in the near future.

Foothills and Mountains

The foothill and mountain regions of the County are still used for grazing and the mountain region of the County, below the snow line, is currently used for logging operations and much recreation. Foothill land use has significantly changed with the rapid introduction of retirement homes and mobile homes on "split lots" and developments generated in the name of "recreational" subdivisions. These split lots and rural foothill subdivisions provide large, isolated lots for retirement homes, although very little in the way of "second homes" for recreational purposes have developed, despite the advertisements and promotional devices of the sales organizations for the major "recreational" subdivisions there. Recognization that the principal dwellers in these foothill and mountain areas are permanent dwellers and not just recreational visitors has prompted a change in local political attitude concerning the provision of public facilities in these divided lands. Current land use regulations are discussed elsewhere in detail in this part of the report; however, a general trend toward the developer providing more of the basic facilities for access and public service, as well as water and, in many cases, sewer facilities, has been the trend in local government requirements.

Agricultural Uses

Economic pressures on farming and ranching today will probably continue to modify the uses of land and increase the sizes of operations where these new "corporate" uses can economically take place. For the first time in the history of Madera County a significant competition from a non-agricultural land use is beginning to take place. A division of large acreages into speculative subdivisions in the valley area has created some understandable concern. The question as to whether it is best to use this land for agricultural production and to plan for its use in more intensive agricultural production in the future or, on the other hand, to allow its division into small, suburban-type speculative lots. The division of the land into speculative lots creates an immediate increase in the tax base resulting from that area; however, new information indicates that there are probably some long-range negative effects on the tax base and economic development patterns of the County resulting from such land division,subsequently followed by failure on the part of the buyers to actually develop the property as residential sites.

A Critical Problem

A critical, practically "bombshell" problen exists in the extensive, inappropriate zoning of the majority of the lots in at least one major area of the valley subdivided lands. These are mostly in R-2 or apartment-type zoning. The choice of the term "inappropriate" is made in view of the fact that there probably is not enough water supply available in that part of Madera County to serve half of the potential population that could be put on those lands where they used to the extent possible by the zoning now existing over most of the area. Tremendous public investment in sewer and water facilities and in new and improved road facilities in and near the developments would certainly result. Most importantly from the point of view of this study and plan regarding open space is that there is no provision for any public open space in that area of more than one and one half times the size of the existing City of Madera. This Open Space Plan must recognize the potential problem for open space planning in the future if the densities allowed by the zoning in that area should ever be achieved.

The result of the interaction of these two major directions in land use trends, that is: toward intensified agriculture on the one hand and toward speculative subdivision for assumed future residential uses on the other hand, provide the dynamic background for current policies and regulations designed to guide the future use of land in Madera County.

Open Spaces in Existing Land Use

The inventory of existing land uses in Madera County recently completed was presented in two principal ways in Table 1 and Table 2. Table 1 presented the information in terms of proportions of land uses in the whole County. Because of the overwhelming effect of the National Forest, Bureau of Land Management, and certain other Federal lands on these proportions, Table 2 was used to inventory existing land uses lying outside of the National Forest. Approximately one quarter of Madera County is covered by the National Forest and we can assume that this land will remain essentially in open space uses through the control of Federal agencies over a long period of time. On the other hand, more probability exists that local government and State government can influence uses of land in that area outside of the National Forest and therefore, this discussion principally focuses upon those proportions of land use found in Table 2, outside the National Forest.

Agricultural Land

Over 94% of Madera County's land outside the National Forest is used for agricultural purposes. Of that amount, about 42 1/2% is in cultivated cropland and 57 1/2% is uncultivated. The latter sub-category includes all of the grazing land. Institutional land uses and public land each account for a little less than 3/4 of 1% and all recreation land in the County outside of the National Forest amounts to approximately 2/3 of 1%.

About 2% of the County is occupied by vacant residential subdivisions while less than 1/2 of 1% is occupied by residential uses. Roads and railroads account for approximately 1.3%. Easements for power lines and other utilities that generally go across country and do not lie in the road right of ways or on them are not separately categorized.

Commercial and industrial land uses amount to approximately one tenth of 1% of the land uses in Madera County outside of the National Forest.

It is obvious from the listings of land uses in Madera.County shown above that the overwhelming source of open space is the agricultural use of land. Perhaps, then, one of the major keys to preserving open space in Madera County is through the preservation of a viable agricultural enterprise in this place.

TABLE 1

INVENTORY OF EXISTING LAND USES - MADERA COUNTY, 1966

(Shown in Acres)

CATEGORIES OF LAND USE (& Land Use Map Color Code)	AMOUNT OF LAND IN GIVEN USE (Acres)		% OF LAND IN GIVEN USE		% OF MAIN CATEGORY IN EACH SUBCATEGORY ITEM*
	Main Category	Sub-Category	Main Category	Sub-Category	
AGRICULTURAL (Green)	838,955		60.89%		
Cultivated cropland (Med. green)		335,285		24.33%	39.96%
Uncultivated grazing & idle (Light green)		503,670		36.55%	60.03%
RESIDENTIAL (Yellow)	3,828		0.28%		
Urban & community		1,803		0.13%	47.10%
Rural farm & ranch		1,393		0.10%	36.39%
Rural non-farm subdivisions		632		0.05%	16.51%
COMMERCIAL (Red)	327		0.02%		
INDUSTRIAL (Purple)	741		0.05%		
Wrecking & Junk yards		77		0.01%	10.37%
Gravel pits, quarries, & mines		298		0.02%	40.16%
Lumber mills		113		0.01%	15.22%
All other industrial		253		0.02%	34.09%
INSTITUTIONAL (Blue gray)	6,206		0.45%		
Schools		364		0.03%	5.86%
Other government uses		98		0.01%	1.58%
Hospitals, cemeteries, churches & halls		347		0.02%	5.59%
Utilities					
Madera Airport		24		0.00%	0.39%
Madera Canal		1,785		0.13%	28.76%
Lower San Joaquin Flood Bypass		3,300		0.24%	4.64%
All other utilities		288		0.02%	53.15%
PUBLIC LANDS (Blue gray)	323,552		23.48%		
National Forests (Multiple use portions only)		317,022		23.01%	97.99%
San Joaquin Experimental Range		4,580		0.33%	1.42%
Vacant Public Domain Land (B.L.M.)		1,950		0.14%	0.60%
RECREATION (Dark green)	162,407		11.79%		
Public					
National Forests (Recreation-only)					
Minarets & Muir Wilderness		78,080		5.67%	48.08%
All other Nat'l Forest recreation-only		649		0.04%	0.39%
Yosemite N.P. & Devils' Postpile N.M.		78,104		5.67%	48.08%
Millerton Lake S.R.A.		3,296		0.24%	2.03%
All other public-county, city, etc.		1,382		0.10%	0.85%
Private		896		0.06%	0.55%
ROADS AND RAILROADS (Black line)	15,568		1.13%		
State maintained highways		1,689		0.12%	10.85%
County maintained roads		6,822		0.49%	43.82%
City maintained streets		790		0.06%	5.07%
National (mostly U.S. Forest Ser.)		4,008		0.29%	25.74%
All other roads		1,360		0.10%	8.74%
Railroads		899		0.06%	5.77%
VACANT (Blank)	26,332		1.91%		
Residential subdivision		13,189		0.96%	50.08%
Within National Forests		8,960		0.65%	34.02%
All other		4,183		0.30%	15.88%
TOTAL LAND AND WATER AREA	1,377,916	1,377,916	100.00%	100.00%	--

*For example, the 335,285 acres of cultivated cropland represents 39.96% of the total agricultural acreage of 838,955 acres.

Source: Madera County Planning Department Field Survey, 1966; Madera County Assessors Records and Maps; Madera County Subdivision Records; U.S. Forest Service; U.S. Bureau of Reclamation; U.S. Bureau of Land Management; U.S. Census of Agriculture, 1964; California Division of Beaches and Parks; California Division of Highways; and California Reclamation Board.

Note: Data collection, analysis, and preparation of materials for this table was accomplished by the Madera County Planning Department, utilizing local funds only.

TABLE 2

INVENTORY OF EXISTING LAND USES - MADERA COUNTY, 1966
(West of National Forest)

(Shown in Acres)

CATEGORIES OF LAND USE (& Land Use Map Color Code)	AMOUNT OF LAND IN GIVEN USE (Acres) Main Category	Sub-Category	% OF LAND IN GIVEN USE Main Category	Sub-Category	% OF MAIN CATEGORY IN EACH SUBCATEGORY ITEM
AGRICULTURAL (Green)	838,955		94.15%		
Cultivated cropland (Med. green)		335,285		37.63%	42.45%
Uncultivated grazing & idle (Light green)		503,670		56.52%	57.57%
RESIDENTIAL (Yellow)	3,828		0.43%		
Urban & community		1,803		0.20%	47.10%
Rural farm & ranch		1,393		0.16%	36.39%
Rural non-farm subdivisions		632		0.07%	16.51%
COMMERCIAL (Red)	327		0.04%		
INDUSTRIAL (Purple)	741		0.08%		
Wrecking & junk yards		77		0.01%	10.38%
Gravel pits, quarries, & mines		298		0.03%	40.16%
Lumber mills		113		0.01%	15.23%
All other industrial		253		0.03%	34.14%
INSTITUTIONAL (Blue gray)	6,206		0.70%		
Schools		364		0.04%	5.86%
Other government uses		98		0.01%	1.58%
Hospitals, cemeteries, churches, & halls		347		0.04%	5.59%
Utilities					
Madera Airport		24		0.00%	0.38%
Madera Canal		1,785		0.20%	28.75%
Lower San Joaquin Flood Bypass		3,300		0.37%	53.16%
All other utilities		288		0.03%	4.64%
PUBLIC LANDS (Blue gray)	6,530*		0.72%		
National Forests (Multiple use portions only)		**		**	**
San Joaquin Experimental Range		4,580		0.51%	70.14%
Public Domain Land (B.L.M.)		1,950		0.22%	29.86%
RECREATION (Dark green)	5,574*		0.63%		
Public					
National Forests (Recreation only)					
Minarets & Muir Wilderness		**		**	**
All other Nat'l Forest recreation only areas		**		**	**
Yosemite N.P. & Devils' Postpile N.M.		**		**	**
Millerton Lake S.R.A.		3,296		0.37%	59.13%
All other public-county, city, etc.		1,382		0.15%	24.79%
Private		896		0.10%	16.07%
ROADS AND RAILROADS (Black line)	11,560*		1.30%		
State maintained highways		1,689		0.19%	14.61%
County maintained roads		6,822		0.77%	59.01%
City maintained streets		790		0.09%	6.83%
National (mostly U.S. Forest Ser.)		**		**	**
All other roads		1,360		0.15%	11.76%
Railroads		899		0.10%	7.78%
VACANT (Blank)	17,372*		1.95%		
Residential subdivision		13,189		1.48%	75.92%
Within National Forests		**		**	**
All other		4,183		0.47%	24.08%
TOTAL LAND AND WATER AREA	891,093*	891,093	100.00%	100.00%	--

*Reduced subtotals result from the exclusion of Federal lands in the eastern County.

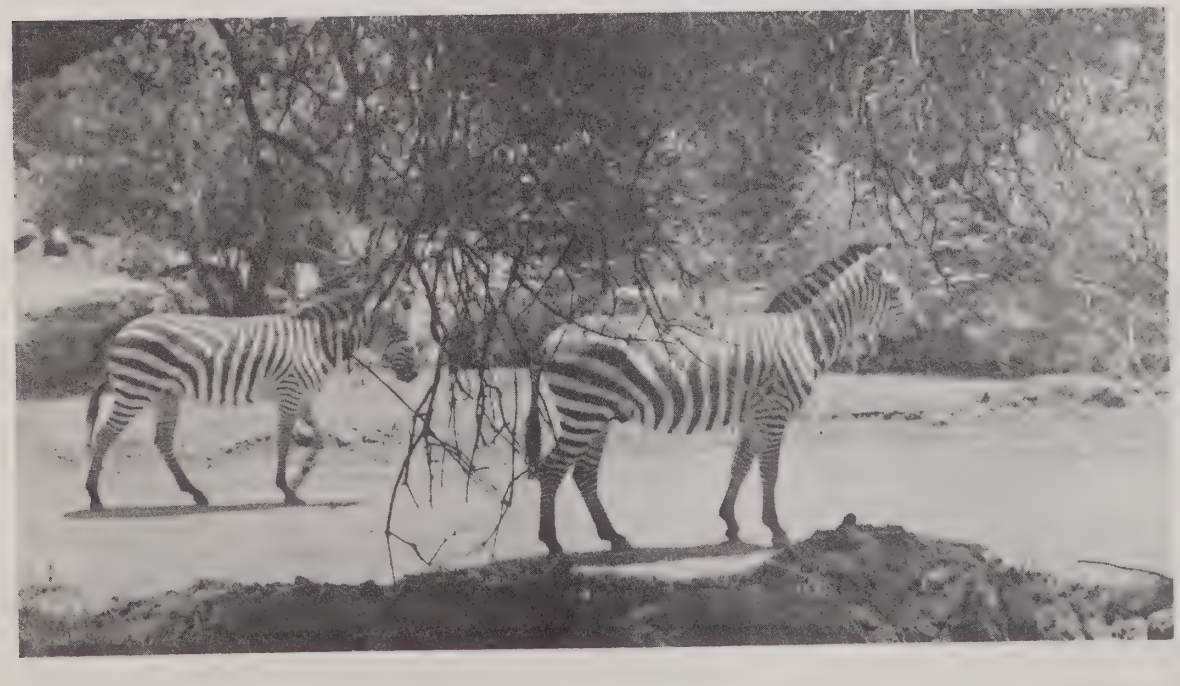
**Not applicable here, since these are the areas excluded from this recalculation

Source: Madera County Planning Department Field Survey, 1966; Madera County Assessors Records and Maps; Madera County Subdivision Records; U.S. Forest Service; U.S. Bureau of Reclamation; U.S. Bureau of Land Management; U.S. Census of Agriculture, 1964; California Division of Beaches and Parks; California Division of Highways; and California Reclamation Board.

P.O'R.

This kind of scene is a part of the great attraction for recreation seekers, tourists, and retired dwellers. The forest provides a local economy in lumber, an attractive scene, and valuable cover for slow melting the mountain snows to slow down flood runoff.

These exotic newcomers among the natural wildlife of Madera County's foothills are an index of the value of these open lands for recreational-oriented new commercial activity such as this open air zoo near Coarsegold. The Safari World outdoor wildlife zoo is one of a chain of recreationally-oriented enterprises that bring much outside money to Madera County for injection into the local economy. The continuation and current viability of such recreationally-oriented commercial enterprise depends directly upon the availability of open space.



P.O'R.

R.L.W.

Subdivisions with more building sites than the locally stable population needs provide some interesting open space. In a local building economy that seeks a profit on lot sales as well as on new buildings, these lots will, ironically, probably be some of the last to be built on. There is great danger of the evolution of rural slums here, as the lot prices decline with the speculative zeal. This land will probably never revert back to an agricultural use, thus diminishing the possibility of positively contributing a flow of basic income to the local economy. Taxes are currently falling on these lots in response to successive resales at lowering prices.

LAND USE CONTROLS

The conservation or otherwise provision of open space in Madera County's future will depend principally upon the workings of land economics related to agriculture and water availability here. However, a strong influence to avoid trends detrimental to the public interest in Madera County can be exerted by the application of certain acceptable land use controls and land division controls. In Madera County at this time a Zoning Ordinance and land division ordinances, together with certain health and Road Department requirements and in conjunction with State and Federal requirements affecting some land uses, control and regulate some of these trends in land use, division, and development.

Madera County uses rather limited zoning control to influence land use trends; however, using rather more stringent controls to govern the division of land. At least a part of the concept behind this application of stronger controls for land division and weaker controls on land use lies the concept that, to a degree, land uses will emanate from land divisions. A second major concept behind these regulations is that the effects of land divisions into very large parcels does not seem to be as irreversible in effect as is the division of land into very small parcels. It appears that virtually any size parcel of property can be sold with the proper marketing techniques, so this County has recognized the need for some limitation on minimum lot sizing. The requirement for minimum lot sizes incorporated in zoning and the requirement for nearly urban type facilities to be provided by developers in small lot land divisions has effectively braked the massive and prolific speculative division of lots on low valued, dry land agricultural areas in the valley and, if nothing else, has raised the standards of quality in requiring the development of basic public facilities in subdivisions and land divisions.

Significantly absent, however, in the gamut of requirements for subdivisions here is any concrete requirement for open space or recreation within new developments. The Board of Supervisors has been reluctant to have public lands put into public open space categories, thus removing these properties from the tax rolls in these newer developments. The idea that the immediate tax dollor loss through the dedication of some of these lands for recreational or other open space uses within the development would be transferred to adjoining lots as additional values to generate a higher tax base after all has not been accepted. The idea of requiring offers of dedication for eventual lands for open space uses, but of not accepting such parcels until the need evolved, (and in the meantime allowing the land owner to profitably use the land while operating under a Williamson Act contract), is discussed elsewhere in this report. It is also contained in the recommendations for policies in this plan element.

LAND USE TRENDS AND RELATIONSHIPS

Analysis of some existing trends in land use development in Madera County indicate the relative importance of new land use controls or other devices for altering the trends which are moving in directions that would tend to diminish open space or to create patterns of open space that are not desired in the long-term plan for Madera County.

Despite an early ambivalent attitude on the part of some dry grain and grazing land holders, very little real interest was shown in the California Land Conservation Act of 1965 and 1966. These land owners have subsequently enthusiastically embraced the Williamson Act. The substitution of appraisal methods by the County Tax Assessor which are based upon the ability of the land to produce agricultural wealth rather than upon its speculative value for some non-agricultural use, has provided a significant decrease in the real tax dollars paid by such land owners and operators. At this time, approximately 380,000 acres are included in agricultural preserves in Madera County. Lands under contract or agreement and preserves are commensurate in this County. In other words, the preserves are not larger than those lands which are, at this time, contracted or agreed to under the Williamson Act program. The County does have a considerable area of lands otherwise zoned in an exclusive agricultural use category, however, which essentially constitute an agricultural preserve in terms of the exclusive and large-lot agricultural zoning applied there. In the earlier Land Use Report, prior to the preparation of the initial elements of the General Plan of Madera County in 1969, it was stated: "Eventually the threshold of acceptability will be achieved..." That threshold has apparently been achieved and it is reported that perhaps as much as one half as many acres as now exist under Williamson Act agreements or contracts will be brought under the system in this coming fiscal year. It is difficult to understand how many persons owning agricultural land in this County, who is seriously contemplating remaining in agricultural enterprise in the near future would not avail himself of the opportunity presented for reduced or at least stabilized tax payments on that real property.

We saw in the section before this one that very nearly 95% of the land in Madera County outside of the National Forest was in agricultural use. Therefore, if all of the owners of these lands should place their properties under the Williamson Act, a significant redistribution of tax should prevail.

CURRENT LAND USE CONTROLS IN MADERA COUNTY

The effects of existing County zoning and land division ordinances and regulations on land use vary widely.

This group of controls seems to have had some effect on the generation of vacant residential lots. This group of controls began emerging in late 1963 with the adoption of the Water, Sewage, and Subdivision Ordinances, supplemented in 1965 by the County-wide Zoning Ordinance, and in 1966, by the Parcel Map Ordinance.

The most striking result of these interlocking regulations seems to have been the drastic reduction of new subdivision activity of the purely speculative type, and a general slowing in the rate at which new residential lots are created. Raising subdivision improvement standards, or in some cases, requiring certain basic public facilities where none were previously required, and vigorous enforcement of these ordinances has tended to direct developers to link their subdivision activity more closely to real, local housing demand. In the past three years, only one new subdivision application has been initiated in the valley portion of the County. This reflects the impact of what are probably the most crucial regulatory elements: these are the minimum improvement requirements of *both a community sewage system, and a community water system in subdivisions in the valley* portion of the County. In the mountain region of the County it is possible to subdivide into as little as one acre lots without installing a community sewage system, although water systems are required. There, subdivision activity has continued.

Any extension of the community sewage system requirement to the mountain areas could be expected to have the initial effect of sharply reducing the number of new residential lots created. In any case, the land division and zoning ordinances as presently standing should continue to keep the rate at which new residential lots are created well below that which prevailed in the 1950's and early 1960's, and perhaps more nearly paralleling the population growth rate. It must be borne in mind, however, that these trends could be sharply affected by increase in the market demand for residential housing resulting from unforeseen population increases. In any such situation of increased pressure, the amount of land going into residential subdivisions, particularly in the valley, would depend largely on the policies of the County legislative bodies toward rezoning agricultural land for subdivision purposes. It is ironic that the land least likely to develop with new housing is that which was prematurely subdivided while larger, "undeveloped" tracts are more likely to be used by local builders who tend to seek profits from lot sales *combined* with home sales. Thus, the prematurely divided lands are not as likely to be be built up as are new subdivisions developed by the builders themselves.

While the above remarks present the broad picture of the effects of zoning and land division regulations, they should not be construed to mean that no local exceptions to this picture exist; a number do. The stronger market for residential land use in the vicinity of the City of Madera has resulted in some encroachment upon prime agricultural land and there is a potential for more of the same. This may be seen in the area immediately west of the City, along Avenue 14, and south of the City in the application for the Sunnywood Subdivision. These are relatively minor amounts of land but illustrate the possibility of real problems if expanded indefinitely. The question of encroachment on prime agricultural lands is discussed further in the section on agricultural land use patterns.

Turning now from subdivisions, the effects of this complex of County regulations on the amount of land going into other rural residences, (both farm and non-farm)is harder to gauge. Detailed statistics for earlier years are generally not available for comparisons, and the picture may be confused by the rural population levelling off or even declining in many agriculturally-zoned districts, due to a significant increase in mechanization of farming during the 1950's and early '60's.

Nevertheless, the Planning Department experience in administering the zoning ordinance provisions during the last two years, gives some indication that limits have been generally effective on the spread of scattered, rural, non-farm residential uses of land in agriculturally-zoned districts. The most effective regulation in these cases has been the limitations placed upon the number of dwellings permitted for each of the several agricultural zones. At a minimum,these provisions of the agricultural zones (specifically, the ARE-20, ARV-20, AR-5, and AR-20), have the effect of preventing growth of casual, unplanned residential communities in agricultural districts. It is important to note that the key element in these valley agricultural zones (i.e. large lot area regulations, and strict limitation on number of dwelling units) is absent from the mountain agricultural zones; ARF and -RM. Thus it is still possible and relatively easy for scattered rural, non-farm residential land uses to develop in the mountain areas outside of subdivisions or other residentially zoned districts. Current local concepts of the value of these mountain lands for any economic purpose, other than residential and recreational, are thus expressed in that liberal zoning. The variety of the real estate and home market, however, still seems to provide a reasonable optimum profit to developers of some sewered, small-lot subdivisions. This is true mostly where some unique feature substitutes for individual lot space - for example, Bass Lake at Marina View, proximity to Oakhurst for Hidden Oaks, and planned recreational facilities at Teaford Lakes.

P.O'R.

The dedication of the two new dams in the foothills of Madera County is also providing an opportunity for the generation of new recreation areas adjoining the impounded waters. Plans for recreational facilities adjoining the lakes have been prepared by the California State Reclamation Board and the United States Army Corps of Engineers. Basic recreational areas and facilities will be constructed around the lakes by the Corps of Engineers. Although local government has been invited to manage and maintain the recreational facilities by the Federal and State agencies, that offer has been declined and minimum recreational facilities will be maintained and managed by the State of California. It is likely that private franchised operators will be engaged to operate marina facilities at each lake.

Reddinger Lake now provides additional recreation services to the region subsequent to the construction of new boat launching facilities planned and executed by the State Division of Beaches and Parks in terms of Madera County's local planning and engineering programs. R.L.W.

R.L.W.

This Open Space and Conservation Element of the General Plan recommends that power and communications companies work together to utilize, in a cooperative fashion, fewer hilltops for their passive and active electronic reflectors and antennae. Recognizing that it is thought that a cooperative effort to "gang" these facilities on a few hilltops rather than having them spread out all over the available hilltops eventually will contribute to the scenic values of open space in Madera County. Such facilities are subject to the issuance of a Conditional Land Use Permit through the Madera County Planning Commission, although nearly all facilities in Madera County at this time have been placed in violation or in ignorance of that requirement.

LAND DIVISION AND LAND USE

It is obvious that, in any planning region, the type of land division practiced can have an important effect upon how satisfactory a pattern of land uses will develop. This is attested to by the existence in most planning areas of regulation of subdivision, parcel division, and other similar activities prescribing to what extent and how certain lands may be divided. The workings and effects of such regulations for Madera County are discussed in the section:Current Land Use Controls.

It is also true, though less obvious, that the original, or very early land divisions within a region, have an influence upon present-day land use patterns. A familiar example of such an effect, although on a very large scale, is the wide - spread impress on the American landscape, of the United States Land Survey System with its rectangular townships, ranges, and sections. While not in themselves actually property divisions of land, these survey lines have had a powerful influence on the alignment of property lines and roads and the placement of residences and other land uses. A glance at the Land Use Map of Madera County will, in fact, show just this effect upon the arrangement of land uses in most of the valley portion of Madera County. This grid system has intensified tendencies for the rural population to be highly dispersed; has influenced the typical acreage of farm units; has resulted in some inefficiencies of travel time within the rural area; and has probably made it more difficult to utilize prime soils when these are irregularly interspersed with areas of poorer soil. These observations, however, are not unique to Madera County, but apply in all of the states surveyed according to the U.S. Land Survey grid.

Within the context of the Land Survey grid system, some thought was given to possible continuing effects of the early property divisions in Madera County. Most of the valley area from Avenue 12 north to the County line at the Chowchilla River and west from the vicinity of the S. P. Railroad to the San Joaquin River was included in large lot agricultural subdivisions in the early twentieth century. These areas, (which also included the wide corridor east from the vicinity of Fairmead and then north between the Santa Fe Railroad and the present Madera Canal, around Sharon), were originally plotted for division into five to twenty acre lots, and in the western part of the area, to parcels of twenty acres and greater. Other early agricultural subdivisions extended east and south of the City of Madera between the two railroads, and west and south of the City of Madera, including about one half of the land between Roads 21 and 25 and Avenues 14 and 8. Time did not permit the detailed tracing necessary to determine how many of these intended five,ten, twenty, or larger acreage parcels were actually created four or more decades ago, although few of the original property lines remain today. A large number of these original parcels created then were subsequently reassembled over the years to form the larger acreages which we see today. Some known instances of this happening indicate that it was a likely course of development, where the farmer or rancher could not operate efficently with the smaller pieces.

Today, the trend to larger, corporate or group-owned farms indicates that larger parcels or larger groups of contiguous parcels are needed by these new out-of-doors "industries"; or that intensification by various means will be necessary.

A relevant question for this study is, "to what extent do these early divisions influence present-day types and intensities of land uses?" The area included within these old subdivisions was compared to maps showing property parcel lines, and even within the heavily cultivated portion of the east side, areas skipped by the old agricultural subdivisions show distinctly fewer property division lines today. This lesser fractioning is reflected also in the density of rural residences shown on the Land Use Map. The clearest example of this is shown in the area included between Avenues 20 and 24 and Roads 16 and 18, which,although surrounded by agricultural subdivisions, was not itself included. The Land Use Map shows this area to be largely empty of residences, or only lightly peppered around the edges, while the surrounding area shows the pattern of dense residential use. Many residences are occupied by non-farm families, contributing to conflicts over adjacent land uses. While the fact that some areas on the east side were not included in early subdivisions, probably has some effect on their less intensive pattern of present-day land use, primary importance should probably not be assigned to this factor. More central in explaining differences in intensity of agricultural and residential land use on the irrigated east side are probably natural quality of soils, etc.

The foregoing caution is enforced by the observation that some large west - side areas which were included in these old twenty acre and larger subdivisions, today show no more intensive land use patterns than other west-side areas not included. Further, within the irrigated east side, some areas which were not included then show at least as intensive a pattern of agricultural and residential land use as areas included in the old subdivisions,as a result of repeated division since then by subsequent owners.

When we turn from the valley to the foothill and lower mountain area,we find that early land divisions have had less influence on present patterns of land use. There the physiography of the land and the maintained road pattern has had the most significant positive influence, while the expiration of profitable mining contributed much of the negative influence. There were no early day agricultural subdivisions in the foothill area, and most of the parcels created were cattle ranch homesteads carved out of public domain lands in acreages up to one full section. (However, the total ranch usually encompassed a number of sections.) Redivision

of these original parcels has taken place over the intervening years, so that the average acreage is now probably smaller, but 160-acre, 320-acre, and 640-acre parcels are still common. The land use, however, is uniformly grazing, with widely scattered rural residences, and the old pattern of land division has been no impediment to the introduction of new land uses in the form of non-farm, rural residential subdivisions in the upper foothill area. The only other distinctive pattern of land division in the foothills and lower mountains was the creation of small, irregularly shaped mining claims in the nineteenth and early twentieth centuries. Although some of these property lines still exist, they apparently exert no influence on land use in this district, and are used for grazing, along with surrounding lands.

The lower mountain area, presently the scene of extensive residential subdivision activity from Ahwahnee to North Fork, followed a slightly different sequence than the lower foothill areas. In addition to the homestead and cattle homestead as the basis of acquiring land, much land here was patented out of the public domain under the land patent laws during the 1880's. Large acreages were acquired in this manner throughout the lower and middle mountain areas. Many of the large private parcels included within the present boundaries of the Sierra National Forest were obtained in this manner, at least until the National Forests were reserved in 1893. Additional Forest boundary has shifted eastward in some areas, westward in others, since its original establishment, so that, for example, Township 7 south, Range 21 east, which includes the present town of Oakhurst, was within the general boundary of the National Forest in 1908. Following the logging of these lands, grazing became the predominant use, as in the foothills, with a few remaining sawmills. Again, as in the foothills, earlier land division and assemblies proved no obstacle to much of the area being converted into residential subdivisions Within the National Forest boundary, however, these private timber patent parcels were, in many cases, to provide the basis for much more intensive land uses than existed in the surrounding multiple use of the National Forest. Several of these areas; notably Central Camp, Beasore Meadows, Sugar Pine, Cedar Valley, the Bass Lake Area, and Cascadel Ranch, were to become forest residential areas, sometimes with seasonal occupance and sometimes with permanent occupance.

Present day land developers in the mountain area suffer the hazards and inefficiencies of attempting to create usable lot patterns from some parcels generated by the grid system of the land survey on existing landforms.

On the basis of this brief review, it seems clear that the main types of early land division in the County have had varying influence on the present-day pattern of land uses. They do have an effect upon the appearance of these uses on the landscape. Nothing suggests that the general types of uses or the locations of these uses within the County would have differed, if the original divisions of land had been different, but it is certain that virtually unusable, poorly accessible areas would have been reduced if the persistent application of the land survey lines had been better adjusted to the land forms. Private parcels within the National Forest and adjacent to the National Forest, which show a definite trend toward residential and other suburban uses, probably would not have resulted, in the absence of consistent division.

Turning now to the effects of more recent and present day divisions of land, we see two obvious results, and others not so evident. The creation of new residential subdivisions on agricultural land has the clear result of idling, for a period of time, most of the acreage included within the subdivision. The striking illustration of this effect is seen in the vast vacant acreages shown on the Land Use Map north and east of the City of Madera. Much of this subdivided land is generally considered to be speculative. At least half of this subdivided area in the valley was thus taken out of other uses five or more years ago, and all of it occurred at least three years ago; yet little residential use of that land has developed, and much of it is given little real chance of ever so developing. Even in subdivisions which are securely based upon real local demand for residential land, there is normally a period of time during which these lands remain vacant. The land use problems created by this large stock of long-standing vacant residential land are discussed elsewhere in this report.

This brings us to the long, narrow lot having narrow frontage on public right-of-way and being very deep. Long, narrow lots appear to be very dangerous to the overall objectives of community growth. In many instances it has been shown that the rear portion of long lots have low value to the owners. Consequently this low valued land is often the repository for junk, garbage, discarded motor vehicles and similar useless materials as the years pass. Subsequent divisions of any parcels of this nature result in much wasted land in a community and, if these patterns form in the vicinity of an expanding urban area, the result is very inefficient circulation patterns, as public roads are required to pass by the unused lands as the community expands beyond these areas. As time passes, low assessed valuations on these almost useless back lots reduce the overall general assessed valuation

of the community for tax purposes. Thus that inefficient use of the land is compounded. In addition, the pattern of streets formed by more efficient use of land in urban block patterns is often made impractical because of the great number of land owners that have to be dealt with if a street extension is desired at some future time across these long, narrow parcels.

Finally, it seems clear that, in general, where local pressures to establish new residential uses is great enough, divisions by cascading ownership, (sometimes through one or a few brokers), takes place. Where developers have attempted or claimed to attempt to "force" development, speculative ownership of unimproved lots has generally resulted. Land divisions carried out by local persons or local firms engaged in building construction has a close correlation with subsequent use of the parcels to the highest degree allowed in local regulation. In other words, divisions of land by local persons or local tract or custom homebuilders, is most likely to result in improvements being constructed on the newly-divided land, according to the recent history of land division here.

TRANSPORTATION-CIRCULATION NETWORK FACTORS IN LAND USE

The basic transportation - circulation network in the County today has existed for many years in its present form. Its basis of generation lies in the development of agriculture on lands surveyed according to the U.S.G.S. Survey. Rights-of-way along section lines had the politically sound attribute of often dividing the right-of-way contribution evenly between adjacent land holders. In addition, cadastral (land survey) methods were greatly simplified by following the section lines. In any event, it was the way road patterns had been established elsewhere, on flat land, where government survey prevailed. In part, the road and rail network evolved to serve existing land uses, and in part, new land uses developed in response to the improved circulation network. One does not always precede the other. Rather than a "chicken-or-egg" kind of speculation as to determining causes, it is helpful to view transportation and land use systems in this continually interacting,dynamic relationship.

Mr. Stanford's railroad, the Central Pacific, probably should be credited with the most significant and long-lasting impact on land use patterns in Madera County, as well as the rest of the eastern side of the San Joaquin Valley. The railroad, paralleled by the major north-south highway on the West Coast, has established an irreversible base line for nearly all urban center land uses and set a base line for related circulation patterns and consequent land uses.

The transportation and circulation system in the valley area of the County is characterized by the relatively dense north-south and east-west grid pattern of roads with superimposed diagonal corridors for the major highway, railroad, power line, drainage, and irrigation canal routes connecting the County with the rest of the region and the State. The foothill and mountain area network, by contrast, does not have the section line grid pattern, is much less dense, and generally trends northeast - southwest with only the two important routes of Highway 49 (Roads 222 and 274), and Road 415 crossing this general pattern. The mountain roads typically follow reasonable grades and are often based on trails or traces established many years ago, usually prior to the establishmentof major arteries in the valley.

One exception to the pattern described, which could have a strong impact on future land use patterns, is Highway 152 leading straight westward out of the County and the San Joaquin Valley. Interconnecting the main artery of the County and the Valley (Highway 99), the future Westside Freeway (Interstate 5), and the main north-south routes from the San Francisco Bay Area, it seems inevitable that this route will increasingly become a principal entrance to central and southern San Joaquin Valley cities. To effectively foresee and plan for future problems which the County will face as a result,the General Plan will have to assess the future effects of this important artery.

MICRO-PATTERNS OF LAND USE

Patterns of land use over the County are very obvious on the map of land uses accompanying this report. There is another pattern of land use within the properties which we can call micro-land use patterns. Examples of micro-land use patterns include the precise method of layout of houses and of farms and ranches; the organization of buildings and other structures involved in industrial uses; and some general patterns of commercial land use, within the property.

First, let us review some of the house location patterns that are commonly in use within the residential land use category. We have chosen some descriptive terms for some of these house-location pattern types. These descriptions are not meant to be critical, but are included to sponsor an appreciation of the variety (thank goodness) of micro-patterns of land uses.

The first of these would be"View-siting". In this case, the house is located on a knoll, an overlook, or some sheltered glen where the homeowner has placed the home in order to constantly view a particularly beautiful scene. The reason for house location in that way is very obvious.

Out in the foothill area, in the lower mountains where ranches are quite numerous, the "Well-Site" ranch house is a predominant pattern of house location on those ranches. They are located where it was possible to find all important water; at the well-site. Another rather obvious kind of arrangement of buildings is the "Urban Cram". The Urban Cram is the result of conflict between the developer's attempts to make the lots as narrow as possible,(thus making as many lots as possible out of a particular site with a minimum road frontage),and the desire of the builders to utilize as much of the property as possible, building a house as wide as possible on that lot. The result is a consistent pattern of buildings greatly set back but tightly jammed together, often with too little space between them to be able to get a motor vehicle or trailer or fire truck into the back yard of these homesites. Thus the "Urban Cram" pattern of land use is quite obviously dominated by economic factors. A variation on "Urban Cram" is "Suburb Row". Suburb Row seems to be a function of direct response to governmental regulation of the minimum setback allowed on the lots, (although emphasis is often made in ordinances that the setbacks specified are only *minimum* and that the owner may set back farther than that if he wishes). This is seldom the case; the homes are usually built right up to that line. A very uniform and often monotonous pattern of house siting in subdivisions thereby results.

Today, with the replacement of older houses, we are seeing an example of the phenomenon of house location where the old well and septic systems were located on the lot. Despite whatever reasons there might now be for relocating the residential house on the property, that small additional cost of extending lines to the old hook-up point of the septic system and to the well often dictates that the new building is placed where the old one was, whether that is the right place or not in terms of today's reasons.

Another pattern of house siting has evolved here in Madera County and in many other California communities. This is the "Mid-patch Single". "Mid-patch Singles"are those single family dwelling units located right square in the middle of a large suburban lot. The apparent purpose in locating here is so that the homeowner could gain maximum isolation from his neighbors and be in an optimum position to view his domain in all directions.

There are two other patterns of house siting in residential land use areas that appear to have arisen from cultural backgrounds more than for any other reason. The first of these two ethnically-derived patterns is the "Hacienda". In this pattern, one or more sets of residential buildings is located in roughly a horseshoe or almost closed circle-shape and activities of the family or several families living on the site are directed inwardly to the central plaza that results. It is possible to see the repetition of the "Hacienda" pattern often in the valley, especially where several families are living on the same lot.

The second of the two obviously culturally derived patterns of house siting within the residential land use is what could be called "Back-Yard-Row". This micro-pattern involves a large and usually relatively expensive home nearest the main or public road on the lot. Running alongside this house will be a small driveway, usually unpaved, and in line alongside this dirt track in back of the main house are a series of small houses facing the dirt track. This pattern usually begins with the owner of the property and the home in front renting the small, often shack-like buildings in back to other people, often to people who work for the owner of the house up front. Today, this pattern has been modified, often by the sale of a tiny bit of property and the house on it to private owners. The unfortunate result is a string of very poor houses facing a private, unpaved dirt road. These are generally confined to the valley.

The detailed road pattern undoubtedly has many secondary or lesser effects on the specific arrangement of land uses within the overall patterns. There are many minor ways in which the road network guides and shapes the pattern of land use. One such relationship is the way in which the intensive section-line road road system has influenced the land use pattern of the valley area. The opening or improvement of a County road promotes or intensifies land divisions in the vicinity of that road. See how the pattern of roads guides the residential and commercial land use pattern on the Land Use Map of Madera County (back pocket). This close relationship leaves no doubt that the patterns of public roads directs the principal patterns of land use. Clearly, there is an important relationship between accessibility by road and the number of land divisions taking place in any area. Each new road constructed generates an immediate (and sometimes advance, speculative) pressure to divide adjacent lands. Recent changes in State and local laws requiring publicly dedicated rights-of-way in conjunction with small divisions of land create more assured public routes and thereby *open up more land* for "development". On the other hand, some new major arterials restrict direct access onto the high speed road and thereby restrain adjacent rapid division.

One striking distinction between most of the State - maintained highways in the County and virtually all of the mileage of the County-maintained roads, is seen in their relative ability to generate commercial and other highway-oriented uses. There are very few instances outside of the cities or small rural communities where traffic on County-maintained roads is sufficiently heavy, or sufficiently long-distance to support commercial land uses. It is evident that the traffic threshold necessary to produce such land use shifts, is usually reached by roads which carry traffic from elsewhere in the State into, or through, the County. As improvements to the State routes reaches the level of limited-access freeway, the usual result is to relocate the commercial land uses at the new interchanges.

While there are few examples of County road construction or improvement resulting in changes in land use to highway commercial or industrial, it is obvious that they do precipitate new land divisions oriented toward new residential developments. Examples of this are seen in the emergence of the Teaford Ranch and Finegold Creek Subdivision proposals as the improvement of County Road 223 across Teaford Saddle progressed. Obviously too,the Lakeshore Park and Marina View Heights Subdivision developments appeared with improvement of high-standard Road 274 around the east side of Bass Lake. A detailed study to compare the dates on which lot splits or large acreage divisions of land were recorded with dates on which road construction or improvements in the vicinity were announced or completed would shed more light on this relationship.

There are few clear-cut examples of similarly specific road influence on residential subdivision development in the valley area. There, few of the rural non-farm subdivisions of the last ten to fifteen years were decided upon as a result of new or improved road access. Rather, the motivations seem to stem from large available, relatively cheap tracts of low income, dry farm land. These developments were largely speculative, and reasonably adequate road access *aready existed*.

There has been no work by County or other agencies which could be described as integrated or overall transportation studies or planning, in the sense of taking account of transportation's interaction with land use or other systems. Such an effort, on an appropriate scale,will be necessary in order to prepare a General Plan for the County which can accurately project and prepare for the many effects of alternative transportation proposals.

The only new transportation proposals which have actually been adopted for the County are the freeway plans for State 152 and part of 145. In addition, a project already under construction outside the County which will undoubtedly have important effects inside the County, is seen in the new Westside Freeway, Interstate 5. Other, indefinite proposals, not adopted at this time as part of the State system, seek an eastside freeway running northwest - southeast through the lower foothills with an extension of State Highway 152 eastward to such a freeway, and the freewaying of the remainder of State Route 145 and all of State Route 41. Proposals for a future trans - Sierra crossing within the County, often referred to as "The Minarets Summit Highway" should also be considered in terms of influence on land use; how it might generate new and greater valued uses of land, and conversely, how it might tend to generate problems in land uses.

Home siting in the mountains often is influenced by avoidance of streams or drainage areas and often arranged to avoid rock outcrops or take advantage of the shade of a convenient tree. Some very old mountain communities began as logging camps and the arrangement of today's recreation cabins and some permanent dwellings still follow the pattern of the original camp layout.

In combination with architectural styles of buildings, these house location patterns in the residential areas of our County and in the residential areas in conjunction with agricultural uses, generate the *flavor* of the community. Nearly anyone who has travelled about the United States would realize, almost instantly, that he was in California in the Central Valley, upon seeing some of these house location patterns in combination with these architectural styles.

The Land Use Inventory (Table 1) page has shown an estimate of some 14,669 acres, or approximately 1.06 percent of the County's total area is used for public or semi-public roads of all types. While these statistics include estimates of acreage of the present mileage of State, County, and most U.S. Forest Service-maintained roads, plus the street network acreage in all tract-numbered subdivisions, whether County maintained or not; it omits the extensive mileage of private ranch roads. Tables below, compare the percentage of land area used for public roads with population density for the nine San Joaquin Valley counties. To make the comparison more meaningful, we have (for the five counties containing vast National Forest and National Park lands), calculated percentage of area in roads on a basis of the County as a whole, and then on the basis of omitting the acreage of these Federal lands and of the roads on them. As a further index of road density, we have included the acreage of public road area per person, based on the July 1966 population estimates.

From Table we can see that,for these agricultural counties, the percentage of their area used for roads (taking rural and urban roads together, ranges roughly between 0.75 and 1.75 percent. While Madera County's 1.07 percent (or 1.19 percent excluding National Forests and Parks) is generally within this range; it is, when compared to its population density, noticeably higher than its neighbors. Again, in terms of the *acres of road per person*, Madera County has a distinctly higher index than its neighboring counties with the exception of Mariposa County. This relatively high percentage of area used for roads could simply indicate that the road acreage inventoried here for Madera County is more complete than the available data for the other counties. It is more likely that it is partly generated by a number of subdivisions which have roads but which have very few occupants. In addition, many roads are needed for non-residents who saturate the mountain area in the summer season.

This low overall percentage of county area used for public roads lumps together rural areas having few roads or none at all with the incorporated cities and residential subdivisions where up to 25 percent of the area is used for roads and streets. Table 5 below illustrates this wide diversity. It can be seen that the cities and the urban density subdivisions have between one fifth and one quarter or more of their area devoted to roads, while large-lot residential subdivisions have from five to nineteen percent of their area used for roads.

PERCENT OF AREA USED FOR ROADS AND COMPARISON WITH POPULATION IN 9 VALLEY COUNTIES

Counties	Total County Area (Land and Water) (Acres)	Area Used for Roads (Acres)[1]	% of Total County Used for Roads	Population Estimate (July 1966)	Population Density Persons/Mile[2]	Acres of Roads Per Capita (Col.2 ÷ Col.4)
Fresno	3,843,200	36,383	0.95%	415,600	69.7	0.088
Kern	5,230,080	39,308	0.75%	334,300	41.0	0.118
Kings	893,440	7,725	0.86%	68,000	48.7	0.114
Madera	1,372,864	14,669	1.07%	44,700	20.8	0.328
Mariposa	934,400	6,777	0.73%	6,200	4.3	1.093
Merced	1,269,760	14,006	1.10%	107,600	54.3	0.130
San Joaquin	910,720	15,802	1.74%	278,800	197.9	0.057
Stanislaus	973,440	14,637	1.50%	178,100	118.7	0.082
Tulare	3,102,080	27,939	0.90%	191,300	39.5	0.146

[1]Road acreages were developed by multiplying road mileages by an average acreage per mile based upon typical road widths

Source: California Statistical Abstract, 1966: Tables A-2, B-7, K-3

In addition to the house location patterns, there are patterns of land use on the premises that are also characteristic of this region. Our characteristically good weather results in a lot of outdoor storage of materials and equipment which, in less gentle climates, would of necessity be placed inside a building. As the use of more and more mechanical equipment in agriculture continues, the patterns of land use in Madera County are modified by the inclusion into the local land use scene of more and more kinds of machines. Thus the machinery becomes a part of the micro-pattern of land use.

The sun,during the summer in our valley, is quite a factor in generating small, open sided pole-type buildings, providing shade for operations associated with agriculture and other activities on land.

The use of irrigation waters in the valley portion of the County requires the use of many structures, canals, ditches, and specific patterns of water distribution systems. These patterns are very obvious and contribute very much to the appearance of the valley portion of the County in terms of those water distribution devices.

In the mountain region, the prevalence of lumbering creates very obvious patterns of that activity on land as whole areas are cleared out and replanted with trees, and new logging roads are cut.

Land uses associated with camping,fishing, and boating are not quite so obvious, since they are most often associated with conservation of the natural growth, with the lakes and trees, and therefore do not modify the natural landscape as much as some other land uses.

In many industrial and commercial land uses in Madera County, there is a tendency on the part of owners and developers of these properties to place the more obnoxious and more unsightly features of the activity toward the rear of the parcel and maintain the direct area of public contact up front, around the office of the activity, in a more esthetic state. One of the more obvious micro-patterns of the location of industrial buildings is that pattern formed when industrial buildings are placed along a railroad track. In this case, the axis of the building grouping usually follows the direction of the railroad track. In cow ranch operations, the loading facilities are obviously placed adjacent to a good road, usually a public and surfaced road, to allow the loading of cattle onto the large trucks used today for cattle transport.

Rural businesses generally locate their main building far enough from the main thoroughfare right-of-way so that there is room for vehicles to park perpendicular to the building in front of them. Only a few very old commercial establishments are constructed so close to the road that it is necessary for parking to take place on the sides of the building or in the back. In that respect, the developer of modern business seems to be selling, first of all, a parking space and then whatever goods he has in his building. There are some areas where this is a problem. Some large and steep embankments near the highway in Oakhurst have caused a considerable compromise between the provision of frontyard parking and the setback of the commercial building because of the requirement for excavating into the hillside, in order to get the building back far enough to provide that frontyard parking. In North Fork there was a problem in that respect, because of the down-slope on the south which required the buildings to be built quite close to the highway initially. Northside builders in North Fork mostly perched upon the upslope embankment.

Most recreational land uses are prefaced by a large and esthetically attractive entrance sign or structure, but the main facilities are placed, in general, as far back from the public right-of-way as is necessary to isolate the recreational land uses from the traffic.

Signs are a use of land and are one use of land that is greatly increasing today. Obviously, it is necessary for the signs to be within sight of the driver if the objective is to advertise to the drivers and their passengers, and so, consequently, the very obvious relationship between sign locations and the public highways is made.

Agricultural buildings and agricultural crop rows are often laid out with respect to the direction of the sun, the prevailing winds, or the principal slope of the land. If cooling is a problem, then sun orientation is certain to be a part of the micro-pattern of the location of the land use. If water distribution by gravity flow is a part of the operation,then it is usually the case that agricultural row crops, orchards, and vineyards, will be oriented for the purpose of distributing water down slope.

Out of all of these observations comes some general rules about the location of buildings and other features of land uses on individual properties and in the region. Land uses that are associated with commercial activities are most often oriented to the public road right-of-way. Land uses oriented toward the extraction of minerals or the use of natural resources are obviously directly oriented to these. Recreation

uses are of necessity oriented to the location of recreationally attractive places but also often seek to avoid unnatural or man-made things. Where transportation is the principal problem, orientation to railroad sidings and the major highways forms the basis for the pattern of location of these things.

When land uses are located or mislocated in terms of the principal reason for their being, they are generally an inefficient use of the land. When they interfere one with the other, they also generate certain inefficiencies.

CURRENT LAND USE CONTROLS IN MADERA COUNTY

A family that is building a new home often prescribes what each room of the new house is to be used for, and then the house is designed for those uses in those rooms. An engineer designing a public facility prescribes in advance what each element of his design is to be used for and how it should fit together with the other parts. Many cities, counties, states, and nations today specify what certain areas within their jurisdictions should best be used for, in terms of their objectives for the area. Thus the planning process in the case of the family home, an engineer's design, or an area of public jurisdiction,all base the progress of intended design on the specification for some kind of use of the parts or areas in the design.

Madera County today encompasses over 2,000 square miles, has a permanent population of nearly 50,000 people and a transient population that probably approaches 250,000 in the summertime. It contains areas that fall within a number of local, state, and national jurisdictions. Each organization and, for that matter, each person operating within the boundaries of this County, have set up certain goals for the use of the land under their jurisdiction and,in various ways and to various degrees, have organized these plans and methods to achieve their goals.

A large part of the County is within the jurisdiction of the Sierra National Forest and the persons responsible for that area have determined that the land can best be used in certain ways. From that determination has arisen a number of regulations which control the uses to which the land can be put within the Sierra National Forest. These rules are basically designed to conserve the Forests, but are made flexible and broad enough to encompass multiple uses not in conflict with the basic purpose. More is written about these rules later, on page

A portion of Yosemite National Park falls within the boundaries of northeastern Madera County, and officials of the National Park Service follow prescribed rules for the use of lands and resources within the boundaries of the park. These are designed to preserve the park and fairly distribute opportunities for recreational enjoyment among the great number of people seeking them.

General Plan
Open Space &
Conservation

The Bureau of Land Management is responsible for many public lands, including those within the National Parks and the National Forests, as well as other, more scattered parcels belonging to the Federal domain. The Bureau of Land Management also follows a set of regulations designed to preserve these public lands for certain, (and sometimes uncertain), future uses.

The Madera Irrigation District and the Chowchilla Irrigation District operate under rules which influence land uses as they are related to the acquisition and distribution of irrigation water supplies. The Lower San Joaquin Flood Control Bypass concerned with the removal of flood and excess water from lands in Madera County also modifies uses of land in some cases.

Madera County, the City of Madera, and the City of Chowchilla are very specific in their control of proposed land uses through their zoning ordinances. These are direct and comprehensive land use controls. Only an owner of land has greater control over its use.

There is one other kind of land use control that is not easily defined. This derives from the cultural factor; it arises from the rules that people make for themselves in the use of their own land. These rules are often the result of observation of how relatives and neighbors use their land. The habits of land use applied by the individual probably begin in childhood when each person learns to organize his own possessions in an orderly, or perhaps a disorderly fashion, and to conserve or to expend those possessions. Individual choice of how one's personally-owned real estate shall be used is the primary effective force now at work controlling how land is used.

Now, although each of these organizations or individuals may wish to use land in a particular way, or attempt, through thought or habit, to use that land in the chosen way; these land use choices are modified by natural forces and conditions. An extreme example of this would be a dairy farmer attempting to carry out his chosen land use on top of the Minarets. A less extreme, but nevertheless very real example, can be seen in the choice of industrial

VACANT AND OTHER ACREAGE AND LOTS IN TRACT-NUMBERED SUBDIVISIONS

MADERA COUNTY, 1966

	Valley Area		Mountain Area		Total County	
	Acres or Lots	Percent	Acres or Lots	Percent	Acres or Lots	Percent
Subdivision Acreage						
Acreage in Lots	11,090	88.72%	2,731	81.69%	13,821	87.24%
(Vacant)[1]	(10,850)[1]	(97.84%)[1]	(2,339)	(85.65%)	(13,189)	(95.43%)
(In Use)	(240)	(2.16%)	(392)	(14.35%)	(632)	(4.57%)
Acreage in Roads	1,410	11.28%	612	18.31%	2,022	12.76%
All Acreage	12,500	100.00%	3,343	100.00%	15,843	100.00%
No. of Subdiv. Lots						
Lots Vacant	8,064	93.57%	1,695	76.08%	9,759	89.98%
Lots in Use	554	6.43%	533	23.92%	1,087	10.02%
All Lots	8,618	100.00%	2,228	100.00%	10,846	100.00%

[1]( ) indicates subtotals of acreages and percentages above

Source: Official subdivision records on file in Madera County Planning Department and field survey by Planning Department staff, 1966.

sites, where it is often important that the activities be carried out on very level ground in order to minimize energy expenditures in the moving of materials in the manufacturing processes.

One of the most important things to be recognized in the consideration of land use controls is the interaction between these various kinds of land use controls. If the Bureau of Reclamation or the Army Corps of Engineers decides to build a dam and temporarily restrain flood waters from a flood plain below, it might necessitate the moving of a county road to a new place and the abandonment of a house behind that dam by the current land owner, because of the stored water. Everyone is aware that a new road immediately influences the use of land along side of it. Though the road is a land use designed to move people from one place to another, it usually becomes a focus for the use of abutting lands for new residential, commercial, industrial, and usually advertising, uses. The interaction between land uses is a very complex subject and the application of regulations on land uses by individuals and various groups and public agencies is extremely complex with the results sometimes very surprising.

CURRENT MADERA COUNTY ZONING

We will briefly review the Zoning Ordinance of Madera County here. It constitutes the specific attempt to maintain an orderly development of land according to the public determination of safety, health, beauty, and profit for all. What the Zoning Ordinance says, in effect, is that the representatives of the people of this County have decided, after numerous discussions and continuing argument, that certain areas of this political jurisdiction shall best be reserved for certain general land uses, or that some land uses shall not be permitted in some areas. The Zoning Ordinance in any place is usually founded upon the idea that an orderly, organized proposal for land uses, expressed and imposed in a zoning ordinance is preferable to the general chaos that would otherwise result. There is implicit in the zoning controls the idea that they crystalize the democratically concerted public idea of the kind of place in which people wish to live and work. There is implicit in the use of a zoning ordinance the idea that the goals and methods set forth to reach those goals will persist for some time, in an orderly way; whereas the composit proposals for land use, coming from tens of thousands of changing individuals, would change like the waves on the ocean and provide no sound or stable base for reaching public goals in the future.

The Zoning Ordinance, with its land use controls, is largely a set of descriptions of specific procedures to be followed by the elected officials or appointed officials of the community in seeking the goals expressed in the zoning maps which accompany the text of the ordinance. It is inherent in American law that every action of the public officials responsible for administration of a law be made specific and be limited to absolute essentials. This is probably why the bulk of the ordinance concerns how it is to be administered.

The Madera County Zoning Ordinance encompasses 29 kinds of land use zones and, additionally, utilizes 15 specific conditional uses that can be placed in one or several of these zones providing certain precautionary conditions are met by the land user. In addition, there are provisions for using the land in new ways not specifically regulated in the ordinance, and that flexibility is especially designed into the ordinance.

There are 17 districts in which residential uses are automatically allowed, and 5 other districts where certain conditions should be met if a residential use is contemplated. There are 7 kinds of commercial districts, and commercial uses can be placed in industrial areas if certain conditions are met. There are 2 specific kinds of industrial zones; and there are areas for quarrying, mining, and drilling; areas for institutions;areas to be used for open space purposes without occupied structures; and, (significantly for an agriculturally-based county), there are 5 agricultural zones and several in which forestry and its related industries are not only allowed but encouraged and protected.

The maps of the Zoning Ordinance generally express the concept that areas away from existing community development require the least control and that, conversely,those in more highly developed or rapidly developing areas deserve the greatest protection from disabling neighbors. The zoning ordinance expresses the general plan which the elected officials of this County - the County Board of Supervisors - have in mind for this bit of earth for which they are responsible.

It is obvious from inspection of the Zoning Maps that much emphasis has been placed upon perpetuating existing land use patterns and thereby maintaining some development trends already set in motion. It may not be so obvious, but much of the zoning applied elsewhere in the County is designed to encourage orderly development of the land and to discourage the helter-skelter scattering of land uses. Often these scattered uses could serve the public best, and often serve their own ends best,by being located in close proximity with similar uses.

General Plan
Open Space &
Conservation

There are many laws which govern the overt behavior of individuals toward each other. Those laws generally seek to preclude physical or economic injury being inflicted on one person by another. The concept of land use zoning as a law originated with the idea that certain uses of land could injure the value or use of an adjacent area. Of late, there has been more concern about how certain uses of land within a region can work to the detriment of all the people in that region by aggregate effect, even though each individual use of land may not directly adversely influence the immediate neighbors. Land use controls originating from that concept are designed to minimize the cost of public services for which money is collected each year in the tax system, and to reduce the aggregate adverse effects of certain land uses on all other properties in the area, or within the whole community.

The Madera County Zoning Ordinance, (Ordinance #298), is not too unlike zoning ordinances in other counties, although it has certain details in it that were chosen by the public and their representatives to best serve local ideas of how land can best be used in this place. In general,the Madera County Zoning Ordinance seeks to minimize negative effects upon the value of adjoining properties because of how the land is used. The procedures followed by administrators of the ordinance insure that neighbors are informed when land uses are proposed on nearby properties that may (or may not) have a detrimental effect upon their properties. These procedures afford neighboring land owners and users the opportunity to express their support or opposition in public when a substantially new land use is proposed. The Madera County Zoning Ordinance attempts to stabilize certain land uses, particularly in residential areas, so that investors or occupants in such areas are not surprised by unanticipated detrimental and neighboring uses.

On the other hand, other parts of the Zoning Ordinance are designed to encourage the economic expansion of commercial and industrial enterprises with a minimum amount of interference among such enterprises; and also between such enterprises and other, non-commercial or non-industrial uses. There is also an attempt to encourage efficient groupings or arrangements of similar or dependent land uses. In addition, the Zoning Ordinance attempts to limit the load placed upon natural resources and natural abilities of the land to avoid the untimely depletion of critically-needed resources such as water or to exceed the capabilities of the land, as with sewage disposal systems.

At least in part, the Zoning Ordinance attempts to limit the load placed upon certain public facilities and services in order to minimize the cost of these public facilities and services. An example of this can be seen in the requirement for off-street parking in certain areas,notably commercial areas, where parking would otherwise congest the publically-provided streets and highways.

Finally, the Zoning Ordinance acts to create safe and healthful environments. An example of safety can be found in the requirement of the location of structures away from streets and highways where noise and dust and the possibility of the collision of a motor vehicle with the structure is somewhat mitigated by the requirements of the Zoning Ordinance.

Or,another example of the action of the Zoning Ordinance to create a more healthful influence can be found in the requirement for open areas and lot dimensions relative to the structures on the lots. These are most often thought to be necessary to maintain healthful conditions for home occupants in terms of sewage disposal and firebreaks and "noise breaks", but some consideration must be given to the contributions of open areas toward the health of the human spirit as well.

To a degree, the current zoning maps are an expression of the currently acceptable public idea of the best ways to use the land within the confines of the abstract boundary surrounding this piece of earth we call "Madera County". Essentially a group of people have gotten together and decided that they would like this community to grow according to the patterns expressed in that series of maps. The General Plan for Madera County, to be completed next year, will represent a further refinement of the planning process expressed in the zoning maps.

LAND USE CONTROLS IN SIERRA NATIONAL FOREST

The administrators of the Sierra and Inyo National Forests are members of the United States Department of Agriculture Forest Service. They serve the California region and are responsible for the efficient management of 399,759 acres of land in Madera County. Their management program focuses on the resources of the forest and includes management of forage, wildlife, timber, recreation, and the wilderness areas, and encompasses certain engineering and improvement programs, as well as a specific fire protection program.

The Forest Service administers the issuance of Special Land Use Permits governing a wide variety of uses in the Sierra National Forest. Any use of the land requires a permit of some kind. Permits for some minor uses of land,or the removal of certain materials from the National Forest, can be issued by the local ranger. Certain others require the approval of the Forest Supervisor's office or may, in some cases, require approval of the regional, or perhaps the national office. More than 1200 Special Land Use Permits have been issued within the Sierra National Forest. These encompass the use of this land for resorts, schools, summer homes, winter sports areas, pack stations, and similar land uses.

Most of the Special Permits require a fee for the use of the land. This fee is adjusted according to the apparent value of the use, and in that sense might be considered to be determined about the same way that economic rent is determined. By law, 25% of the total fees paid to the Federal government for these Land Use Permits is returned to Madera County for schools and roads.

In addition to the renewable resources such as lumber, important mineral resources are contained within the Sierra National Forest. These mineral resources may be developed under the mineral laws which provide for establishment of mining claims wherever a bona fide discovery of a mineral is made. In a few cases, mineral permits are not issued because of direct conflict with campgrounds and certain administrative sites used by the National Forest.

LOT SHAPES

Lot shapes are an interesting aspect of land use in any community. The shape that individual parcels are cut into is the function of many complex factors. A factor that has significant impact on lot shapes is the United States Public Land Survey. Early divisions of land in the valley portion, of course followed these boundaries and utilized the system of quarter sections and quarters of quarter sections, etc. This has resulted in the proliferation of parcels that are approximately 640 acres, 320 acres, 160 acres, 80, 40, 20, 10, 5, and 2½ acres in size as a result of the breakdown of the sections formed in the U.S. Public Land Survey. The shape of these parcels is usually also a function of this breakdown pattern. The section is square, the half section is a rectangle with the ratio 2 to 1, length to width and so on down the line with successive divisions being either squares or rectangles with ratios of 2 to 1. In some cases, however, persons have purchased a group of small divisions in vertical alignment, resulting in extremely long, narrow parcels. In most cases,however, long,narrow parcels have resulted among the smaller lots formed by subdividing into non-agricultural parcels with a minimum frontage on the public road right-of-way and a minimum reasonable area derived by extending the lot back as far as necessary.

This brings us to the long, narrow lot having narrow frontage on the public road right-of-way and being very deep. Long,narrow lots appear to be very dangerous to the overall objectives of community growth. In many instances it has been shown that the rear portion of long lots have low value to the owners. Consequently this low valued land is often the repository for junk, garbage, discarded motor vehicles and similar useless materials as the years pass. Subsequent divisions of any parcels of this nature result in much wasted land in a community and, if these patterns form in the vicinity of an expanding urban area, the result is very inefficient circulation patterns, as public roads are required to pass by the unused lands as the community expands beyond these areas. As time passes, low assessed valuations on these almost useless back lots reduce the overall general assessed valuation of the community for tax purposes. Thus that inefficient use of the land is compounded. In addition, the pattern of streets formed by more efficient use of land in urban block patterns is often made impractical because of the great number of land owners that have to be dealt with if a street extension is desired at some future time across these long, narrow parcels.

Many parcels formed in the rougher, or mountainous area of the County were, unfortunately, founded upon poor surveys of land. The adjustments of these poor surveys sometimes results in the creation of new, very oddly shaped parcels of property simply because the property boundaries are not as simple, or as easy to work with in the mountain area as they are in the valley area, with the strictly rectangular system. In some cases where parcel boundaries meander back and forth over a stream course, creating inaccessible and largely unusable parcels of land, this pattern of property lines can be called inefficient in that it does not lead to reasonable utility of the land.

Another phenomenon of mountain lot shapes that often leads to inefficient situations is that of mountainside lots. There is a growing number of these lots and they will become more of a problem as time passes. These lots are long and narrow,having frontage on a mountain road, either at the bottom or at the top of the slope. Progressive divisions of land have resulted in long, narrow strips of land contacting a public road, either at the top or at the bottom of the slope. When the owner attempts further division of the land, or even the use of it himself, he finds it necessary to build a winding road within the confines of his property lines, up the face of this slope (or down the face of it), whereas if the property had been divided in a broader way it would be possible to place the public road site more along the contours of the slope, thus more efficiently and more safely serving the land.

It is difficult to speak in terms of the need for efficiency in land use and to mention the need for conserving areas under existing conditions where there seems to be a tremendous amount of unused and virtually unneeded space in the County, but it must be kept in mind that the community is growing and will probably grow at an increasing rate as time passes. This great expanse of land that we now have will some day be very much occupied and very finely divided. The interpretation of land uses as efficient or inefficient is sometimes modified by considerations of the necessity for conservation into the future. However, current, "every day" economies are the existing basis for determinations of land use efficiencies.

Lot shapes in Madera County result from response to street patterns also. Wedge shapes prevail along curvilinear roads,while rectangles predominate on straight roads. Canals and ditches generate a strong influence on lot shapes here in the irrigated agricultural lands. The strange injection of odd angled, relatively small parcels in the foothills area is often the result of old mining claims. "Flag" lots with a narrow neck connecting a back lot to the public road occurs in various parts of the County and seems to be the result of an old lot split of an originally long, narrow lot in most cases. Tiny "well lots" are scattered and sometimes become small "flag" lots when a right-of-way to them is attached.

AGRICULTURAL LAND USE PATTERNS

Some description of the present agricultural land use patterns has been given above. Agriculture, including both irrigated cultivation and dry land grazing uses about 61 percent of the County land area. Of this, 26 percent consists of cultivated cropland, while almost all of the remaining 35 percent consists of dry, seasonal grazing lands, principally located in the foothill area. Most of the 356,217 acres of cultivated cropland, 75 percent of cultivated lands, are devoted to irrigated crops. The present economic base for agriculture in Madera County lies in the activities of raising cattle, grapes, cotton, alfalfa, hay, milk, and poultry. A detailed discussion of the economic prospects for the several crops is presented in background materials in the Overall Economic Development Program of Madera County and in the Annual Report of the County Agriculture Commissioner. Those elements of the agricultural situation which affect the overall land use pattern are discussed here.

Important changes in the agricultural land use pattern are responses to various pressures for intensification of agricultural land use. More yield, better quality, change to new crops, and extension of usable areas are all part of this intensification. These changes have consequences reaching beyond agriculture:

1. An increasing irrigated acreage, particularly on the west side, outside existing irrigation and water districts...

2. A trend toward higher value crops. Most noticeable in this respect are the new citrus plantings on the east side in vacant subdivision lots recently developed for irrigation.

3. A continued pattern of crop substitution for dry-land grain farming.

4. A slow increase in the average farm size and rapid decrease in total number of farms.

5. A tendency to sell out to non-agricultural users as taxes required exceed "economic rent" levels.

6. A trend to corporate or group ownership of farms and ranches.

Since most of the new irrigated lands are outside the existing irrigation and water districts, they depend entirely upon pumped ground water for their irrigation water supply. This increases the probability of overdrafts on the existing ground water supply and of lowering the ground water table, both within and outside the irrigation districts, due to the freeflowing nature of this ground water reservoir.

Thus, this land use trend to greater irrigated acreage further heightens pressure for early completion of surface water supply projects already authorized for the San Joaquin Valley and Madera County. For example, it is estimated that, with completion of the Eastside Division, Central Valley Project, 200,000 additional acres of land could be supplied with surface water for irrigation. The Hidden Dam and Buchannan Dam projects are each expected to provide sufficient surface water supply to irrigate from 10,000 to 15,000 additional acres of land. It should be cautioned that the 225,000-odd acres mentioned above should not be taken as an actual projection of the additional acreage which will come under irrigation in any specified period of time. It is a possibility if all other requirements are achieved. That projection depends upon the configuration of many economic, as well as physical, factors: Will people invest in leveling, ditching, gates, drains, and all the other costly modifications and devices?; Will the soils be suitable and can main canals be economically constructed in terms of the increased relief of landforms in the "new" areas?; Are the national and international markets and related federal regulations conducive to agricultural expansion into these areas?; Have local speculative ventures driven land prices too high to allow the "new" lands to enter into agricultural uses?

Map number shows the distribution of cultivated and uncultivated, (non-irrigated lands, used only for grazing), areas in the County in 1957 and 1966. On the east side of the valley, a significant portion of the area shown as cultivated is used for dryland grain farming. Corresponding cultivated area on the west side (of Highway 99) is almost entirely irrigated. The western portion of the map, therefore, illustrates the shift of land from extensive grazing to irrigated crop cultivation.

This large, generally contiguous, west side bloc shows the main agricultural change strikingly. In 1957, some 92,060 acres of this bloc were used for extensive grazing, but by 1966, this had been reduced to approximately 65,420 acres. This 29% reduction in grazing area of the westside resulted in 26,640 acres being added to the irrigated acreage of the County.

Table below shows the steady increase in the proportion of County cropland under irrigation. It should be borne in mind that the Acreage in Cropland is somewhat less than half of the Total Land in Farms as these categories are used in the U.S. Census of Agriculture. The remainder is practically all non-irrigated grazing land on the west side of the Valley and in the foothills.

The land use shift toward high value, intensive crops results, among other things, from the increased costs of production including labor,and the present trend in agricultural land tax practices which reduces the economic feasibility of crops for which there is a weak market situation or a normally small margin anyway. This is particularly true and relevant to this study in the case of dry land, grain farm lands along the far eastern edge of the valley. Here the trend has been to develop the land for sprinkler irrigation (due to the rolling topography and high cost of levelling), and high value citrus crops. Some small area using a system of closed pipes and tubes to bring water to each tree has also been tried. Apart from the contribution of this trend toward general strengthening of the base of the agricultural economy, this citrus development is interacting with (and possibly partially solving) another major land use problem for this part of the County. That is, a significant portion of this citrus development is taking place on vacant residential subdivision lots which have never been occupied or built upon. Table below shows field estimates of the acreages of citrus planted in subdivisions east of Madera within recent years. The total of approximately 440 acres is significant in that it forms 18.6 percent of all citrus acreage in the County. Regardless of the legal status of these areas as vacant residential lots, this development constitutes a de-facto land use change to a far more productive one.

LAND IN FARMS, CROPLAND AND ACREAGE IRRIGATED, 1950 - 1964[1]

Year	Land in Farms (Acres)	Cropland (Acres)	Irrigated Cropland (Acres)	% of Cropland Irrigated Madera County	8 Valley Counties[2]
1950	823,946	394,273	187,851	47.6	64.6
1954	889,824	393,427	193,804	49.2	71.0
1959	860,647	415,275	207,626	49.9	74.4
1964	774,738[3]	335,285	212,052	63.2	80.3

[1]Source: U.S. Censuses of Agriculture, 1950, 1954, 1959, and 1964 (Prelim.)

[2]Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus, Tulare

[3]This large decline between 1959 and 1964 appears to result primarily from a drop in the amount of "woodland pastured" acreage reported in the later census. This is one of the categories under which foothill grazing land gets reported, and the drop is thought to reflect,in part, the large number of 40 to 160 acre parcel transfers to non-farm owners in recent years.

ACREAGE OF CITRUS PLANTED
IN
LARGELY VACANT SUBDIVISIONS
(As of 1966)

Subdivision Tract No.	Acres of Citrus
146	238
151	32
155	23
35	137
144	10
TOTAL	440

Source: Field Survey by Madera County Planning Dep't., 1966

Between the 1959 and 1964 censuses of agriculture, the average size of farms in Madera County continued to increase, but at a much slower rate than in the other San Joaquin Valley counties, or in the State as a whole. This long-range trend in American and California agriculture reflects the fact that it is becoming increasingly uneconomical to operate the family-size farm and other small farms.

In urbanizing areas, this farm size factor often encourages early, and sometimes premature subdivision of agricultural land. In Madera County, however, the movement of agricultural lands into the subdivision market in the last ten to fifteen years has resulted less from this diseconomy of scale than it has from the increasingly unprofitable operation of the dry-land grain farms on the rolling eastern side of the valley. Within this larger cause, though, size undoubtedly played a role, with smaller dry grain holdings becoming unprofitable sooner and succumbing to subdivision and consolidation earlier. Time does not permit a detailed inquiry here into how, and to what extent, size of holdings acted as such an impetus to subdivision. As discussed elsewhere in this report, increased subdivision standards and changed official attitudes have, since 1965, tended to make speculative subdivisions on marginal croplands less profitable than in some other areas. On better lands; irrigated lands and vineyards a still profitable agricultural economy, in combination with the official land policies mentioned above, seem to be retaining most of these lands for production.

While marginal agricultural lands have thus declined from speculative subdivision, loss of *prime* agricultural lands to urban and other uses has not been a significant problem *thus far* in Madera County. This appears due to the relatively strong economic position of agriculture on these prime, irrigated lands compared to the very modest increase of real (non-speculative) new housing subdivisions. The City of Madera is alert to the necessity of avoiding wasteful competing uses on prime croplands, and its present planning looks toward an orderly and contiguous urban expansion from the present city limits. No significant amount of encroachment upon prime agricultural lands is anticipated in the area west of the Chowchilla city limits. Some industrially-zoned lands south of Chowchilla are in temporary agricultural use until new industries can be established there.

Increasing mechanization of local agricultural activities is slowly changing the characteristics of the various proportions of population in the County. Technological changes in agricultural enterprise have not only increased the economic output of the lands through more intensive production of crops, but have also greatly increased the local basic income which is spent for mechanical products and related materials from outside the County.

P.O'R.

P.O'R.

Open Space performs an important function in the diffusion of wastes which, under more crowded conditions, would cause great problems for adjoining property owners and users. The maintenance of open space around these evaporation ponds is an important consideration in these plans for the conservation of open space in Madera County.

Partly due to an ambivalent attitude on the part of some dry-grain and grazing land holders, little real interest has been shown in the California Land Conservation Act of 1965. The consequences of the recently adopted Proposition 3 - Open Space Amendment - on agricultural land use trends within the County may also be negligible but should be watched for impact. Eventually the threshold of acceptability will be achieved, either by further modification of the State law or in the local economy. The effect will probably be rapid and widespread when that threshold is reached.

ABUSES OF THE LAND

In any land use study, there can be found a number of land uses which are negative in their effect on the general purpose of achieving an orderly, clean community. There are those which trend toward chaotic and unhealthful situations, or create situations which will be significantly uneconomic in the future. In order to make a study of land uses and report on them,it is necessary to exhibit a certain degree of judgment as to what use is being made of land in various places. In addition, to determine abuses of land it is necessary to make some judgment of the relative *value* or *disvalue* of certain uses of land in terms of general objectives. This section of the report contains a discussion of the kinds of land uses which generate chaotic or unhealthful situations or create situations which will be costly or, in some other ways, be uneconomic uses of land. The problem land uses include these: illegal junk yards, improper garbage disposals, water pollution, air pollution, landscape pollution, and specifically poor land uses in terms of local conflicts.

The first of the abuses of land that we will talk about is the *illegal* junkyard. We are not speaking of the legal junkyard, operating on a conditional use permit, properly fenced and located, and operated to minimize negative effects on adjoining nearby properties. Legal junkyards of this nature are very important to the community. They serve the function of providing all important scavaging of discarded materials and equipment that is the increasing by-product of our modern living.

Illegal junkyards, on the other hand, too often have been the focal point for dismantling of motor vehicles in such a way that it blights property values in the vicinity because of the lack of proper shielding of the operations from view of the neighboring properties and because of operating characteristics involving burning and the use of cutting torches. Health problems arise from these operations because many cast-off hulks of motor vehicles or other kinds of junk materials collect water in cavities, generate mosquitoes and provide a place for rats to breed. There is usually a high fire hazard associated with the illicit wrecking yard operation or junkyard; the burning out of the rubberized upholstery and rubber or plastic covered wiring in the vehicle results in local air pollution and the dispersal of foul odors throughout the neighborhood.

The blighting effect of an improperly-operated junkyard or wrecking yard cannot be overemphasized. The range of impact often extends in all directions for several blocks at a minimum and often for miles. Additionally, air and water pollution often result from the operation of the illegal junkyard.

Contrary to this, most legally - operated junkyards are careful about the dispersal of surplus oil and fuels from the vehicles and other devices that they are dismantling and either do not burn, or carry out a careful program of burning designed to minimize problems in the neighborhood.

The problem with illegal junkyards is compounded by certain state laws requiring lengthy procedures for the legal clearance of title of the motor vehicles before they can be removed and dismantled from illegal junkyard operations. This problem will apparently become much worse before it improves. At this time, more automobiles than people are produced in the United States each year. For instance, there will be a little over 4,000,000 human births this year, and nearly 8,000,000 automobiles produced. In California and many other western states, this trend is accentuated even more in favor of automobiles. About 5,000,000 automobiles are scrapped each year in the United States.

Many land owners fall into the situation of becoming operators of illegal junk yards simply through a process of progressive abandonment of motor vehicles on their property and the eventual stripping of valuable parts by themselves or other persons, leaving the hulks in various attitudes and stages of dismantling.

Another version of the illegal junkyard is found along the banks of the San Joaquin River and in several places on the banks of the Fresno and Chowchilla Rivers, as well as along many of the drainage sloughs and some of the irrigation canals. This involves the local disposal of routine junk, garbage, tin cans, bottles, and other material from households in these places. Since no routine or public garbage and trash pickup service is available in the rural areas of the County, These materials either accumulate on the lots or are all too often disposed of in some little ravine along the riverbank or ditch bank. Once an accumulation has started, it attracts more disposal at that place and thus it grows until it becomes a significant health hazard and, in almost all respects, becomes an outright junkyard.

As a result of the negative effect on property values, upon the appearance of the community, upon the health of the citizens of this County, the illegal helter-skelter junkyards are judged to be abuses of land.

The second major abuse of land discussed here is very closely related to that one above; that is, garbage fills. The population of Madera County is expected to more than double by 1990 and the disposal of solid waste by the population will more than double during that time. We are thus faced with a growing problem of how to dispose of how to dispose of the solid wastes produced by County residents. Consumer research continues to produce new and enticing packages and containers that can be conveniently disposed of when empty. Many of these materials will not burn or corrode upon exposure to the elements. They have little value as scrap and even if some of the plastics could be destroyed by burning, many give off toxic gasses when incinerated, further adding to air pollution.

solid and liquid waste continue to be disposed of along the hillsides, canal banks, and roadways, in isolated areas throughout the County. These abuses of land create a repulsive appearance,reduce property values, and create extreme health and fire hazards. Many of these sites are breeding places for vermin and rats; loose papers blow across the landscape; offensive odors are usually prevalent; the fire hazard is very high,with some burning usually going on; and water stands in cans and bottles, creating places for mosquitoes to propagate. Nearby streams are polluted with materials from the disposed-of items and water, going into the the underground water supply, percolates through this material enroute. This is a serious problem that is increasing faster than the population.

Madera County is fortunate that there are few producers of significantly dangerous air pollution. A major portion of air-borne pollutants comes from the burning of agricultural waste products such as vine cuttings and grain stubbles, and weeds along canals and on unused properties. These air pollutants reduce the clarity of the atmosphere, but apparently do not produce significantly dangerous materials. As more industry moves into the area, pollution of the air in this area can be expected. In our mountainous area, several lumber mills dispose of surplus bark and wood material by burning in "tepee" burners. These create a fine haze of wood smoke and the odor of burning wood and bark, which does not appear to be objectionable at this time. In addition, much of the surplus scrap wood product is now being shipped out of the County for use in the production of fibreboard instead of being burned, so that that source of air pollution is considerably diminished now.

Stringent regulation of the application of agricultural chemicals continues to minimize the possibility of air pollution arising from that intensive use of agricultural chemicals. The effects of pollution by most of these chemicals are very much localized at any rate. During certain times of the year, some of the poultry ranches emit clouds of dust and fine feather particles, while some cultivating of dry soil and land levelling operations, with heavy equipment moving vast quantities of dry alluvium, may generate local dust problems. At this time, air pollution or air contamination from motor vehicle emissions seems to be confined to the urbanized portions of the valley. The lack of need for extensive home heating systems in this mild climate minimizes those as a source for air pollution. However, some localized air pollution arises from the burning of garbage and trash on local properties.

The meteorology of the valley portion of this County is not favorable for the rapid dispersion of air pollutants, largely due to the topographic feature of confinement between the Coast Range and the Sierra Nevada Mountains, coupled with an atmospheric condition generating temperature inversions during much of the year. In conclusion, although air pollution is not now a major problem in Madera County, it could well become the basis of very real problems in the future, as the population, and intensification of some of these sources, increases. At present, there are no area-wide or County-wide codes or regulations adopted for the control of air pollution. However, the State of California is sponsoring a study of air pollution and other forms of pollution which may result in regional or State-wide regulation of activities that generate these factors of air pollution.

The fourth principal kind of pollution that we are discussing in this section is water pollution. Beginning with the basic premise that it is impossible to use water in any way without changing its quality, it is important that such a change does not impair the water's usability to such an extent as to make it unacceptable for any other use. Water is the universal solvent and, in addition to substances carried in solution, it is a great transporter of suspended materials. Inorganic matter, such as soil, clay, and sand, are of little consequence; they settle as soon as a drop in water velocity permits. Their greatest impact over a period of time is the reduction of storage capacity behind check dams through the deposition of this silt.

Inorganic matter in the form of dissolved salts, through or over which the water passes, or acquired as a product of the decomposition of organic matter carried in the water, is another pollutant. These salts or dissolved inorganic materials may be acquired as a result of filtration through waste

P.O'R.

An unfortunate aspect of remote areas of the County arises from the great distances to available legal dumpsites. Illegal dumping along remote roads is a specific hazard of large open areas for which solutions are very hard or very expensive to find.

R.L.W.

R.L.W.

An example of the planner's maxim:"If there is no good use for land, there is always a bad use waiting to be applied". This lot, too large for simply a residential site and too small for faming is typical of hundreds of similar parcels on the fringes of the cities where the rear portion of the oversize lot is used for an accumulation of junk. Smaller lots in urban settings are too highly valued and have too little room for such messes. Larger, viable agricultural areas are too highly valued for their production capabilities and such accumulations are either smaller or better confined.

Although water is generally much sought after for agricultural and domestic purposes, floodwaters such as these in scattered suburban areas of the County are a cause for great concern from health and safety officials while at the same time the cost of alleviating such flooding lies beyond the reasonable ability of any taxing entity to alleviate. The avoidance of such natural flooded areas and floodways provides an obvious answer to the avoidance of the health, safety, and tax costs arising from the unfortunate placement of such urban or suburban uses on these low lands.

R.L.W.

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disposal areas which contain inorganic salts, minerals, and other chemicals. In this type of pollution, the materials become an integral part of the water itself, and give it definite characteristics such as alkalinity, hardness, or salinity.

Organic matter such as leaf mold, sewage, or garbage undergoes decomposition in water much as it does in soil. Under natural conditions, streams are able to reduce these materials and to recover from organic pollution. This is accomplished through the effects of gravity, sunlight, air, temperature, and chemical and biological activity. How rapidly a stream recovers depends upon the quality and nature of the polluting matter, interacting with the main recovery operations carried about by bacteria and aquatic life forms. Water recovers from organic pollution by two methods. One occurs in the presence of dissolved oxygen and the other in its absence. In the first, that is, in the presence of dissolved oxygen, the organic matter is broken down biologically into inoffensive, inorganic substances. During this process the dissolved oxygen contained in the water is used up. Since the amount of oxygen in a stream at any given point is limited, there is a limit to the amount of waste that a stream can support before depleting the entire supply of oxygen. Therefore, it is important that land uses adjoining stream sources do not generate more of an organic load than the stream can handle.

Extreme caution should be exercised in land use operations involving organic or inorganic chemicals that are long-lived and dangerous as poisons. An example of this is arsenic leaching of gold from old mine waters. Although mining has decreased almost to non-existence at this time in Madera County, water pollution from mine tailings is still a possibility. Another example: a former problem, experienced by lumber mills in log ponding, was the production of tannic acid in quantities dangerous to stream fish life. Lumber mill operators have converted to other methods of operation at considerable cost to themselves in order to eliminate this potential source of stream pollution.

In areas where septic tanks are used for the disposal of sewage waste, the intensity of land use for residential purposes is critical. The discharge of raw sewage or septic tanks overflowing into streams can otherwise generate a dangerous situation.

The return flow of used irrigation waters to streams and canals is another potential source of contamination to waters. Some pesticides, nitrates, and salts are picked up and carried by the water applied to the fields. Sometimes this water is returned to the stream or canal and, as this process is repeated by ranchers further along the canal the concentration of these contaminants reaches a dangerous point. The formation of drainage districts to provide financing to develop drainage systems to avoid this problem of "tailwater" contamination is being contemplated now.

Finally, intensified land uses involving the pumping of underground water for irrigation could, if overdone, result in the raising of the salt water brine underlying the freshwater aquifer under most of the County. This has happened in some other places in the San Joaquin Valley, although increased surface water irrigation and a controlled maximum density of land occupance are currently the two major controls on this problem.

Landscape pollution is a somewhat more nebulous concept but, nevertheless, it is very real. Papers, glass bottles, tin cans, and other trash line most of the major roads in our County. Abandoned automobiles, old mining and farming equipment, dilapidated structures and excessive billboards all add to distraction from the otherwise beautiful landscape. A danger in landscape pollution to the community lies in the impression that visitors travelling our roads often gain. This impression may provide the impetus for a decision whether or not they will stop and spend time and money in this County; if they will want to return at some future time, or indeed, if they would want to buy land and build a home.

Probably more significant for the *economic base* of the County is the impact on industrial prospects. The seeker of a new industrial site is, after all, a human being, and very often will be required to live in the community in which the new industry is located. Thus, landscape pollution can be very detrimental to any program of industrial development. The cost of roadside litter and landscape pollution is usually not measurable in specific dollars and cents, but it is certain that it will exert a strong negative influence on future development.

Landscape pollution has a tendency to drive property values down as it limits the number of people who would buy property in an area thus devaluated. This reflects in the assessed valuation of the community and thereby reduces the source of funds for the development of all of the publicly-provided facilities and services needed by the people.

Finally, in this section, we will talk about specifically poor uses in terms of land use conflicts. An example of this is the cattle feedlot. In terms of the basic economy of the community, the cattle feedlot is a good, intensified, agricultural industry, providing a high assessed valuation and

generating a significant economic force in the community by providing jobs and generating a truly basic income. On the other hand, adjoining property owners, if they happen to live directly downwind, will express the conflict that exists between residential occupance and such an intensified agricultural use.The basic problem here appears to be the the downwind odors. Another example is the turkey ranch. At times of the year turkey ranches generate some dust and fine feather dispersal into the air and downwind property owners will again express the conflict between adjoining land uses that exist when the downwind uses are residential. These are only two examples of the many possibilities of conflict between agricultural industry and residential land uses. There are many other kinds of conflicts between land uses. There would be no such conflicts if there were no feedlots or turkey ranches but there would probably also be none if the downwind uses were not residential.

Some of these land uses may appear to be quite similar to the unpracticed eye, and in some cases, are identical, but still constitute a conflict. For example, one turkey farm upwind from another turkey farm may still generate the idea that there is a conflict between land uses here because the downwind turkey farmer is under the dust of the upwind turkey farmer.

These conflicts, discussed in the brief examples above, are a prime reason why the pre-planning and organization of land uses into certain regions of the County, by mutual agreement of the citizens of this community,seems to provide a reasonable direction in which seek a solution for these land use conflicts. Thus we can see that a particular use of land, in itself, may not be an abuse of land, but may *become* an abuse of land in terms of the adjoining property users. These are conflicts that will always be with us and which will require significant public effort to minimize. The abuse of land must always be considered in terms of human values and, since these human values change and have so much variety, it must always be specified as to whose terms are being applied when deciding whether a land use is detrimental or beneficial; whether it is simply a use of land or an abuse of land. Because land has no value except that it can be *used* for something, then it is not too important that, aside from digging it up and carrying it away, the land itself cannot be removed, but its usefulness can be destroyed so that its value diminishes almost to the point of disappearance. It is, of course, a purpose of the General Plan, following these several studies, to propose arrangements of land use which will tend to minimize, to eliminate, or at least to reduce the abuses of land and the conflicts of land use in terms of the desires of the people of Madera County, acting through their elected officials.

VACANT LAND INVENTORY

Vacant land accounts for just under 2% of the total County land area. Vacant land, of course, does not include agricultural land that is in use. While 2% may seem to be a small proportion, it is actually a substantial and significant acreage. Especially when compared to some other categories of land use, this "vacant" figure is significant. This is even more so in terms of the definition of vacant land. The definition is fairly specific, excluding, for example, temporary fallow or idle agricultural land, open or only occasionally grazed land that has not been subdivided and that is technically feasible to use agriculturally. Almost all of the vacant land counted is committed or restricted to one or two potential uses by virtue of its legal status or other regulation,and secondarily,for economic reasons.

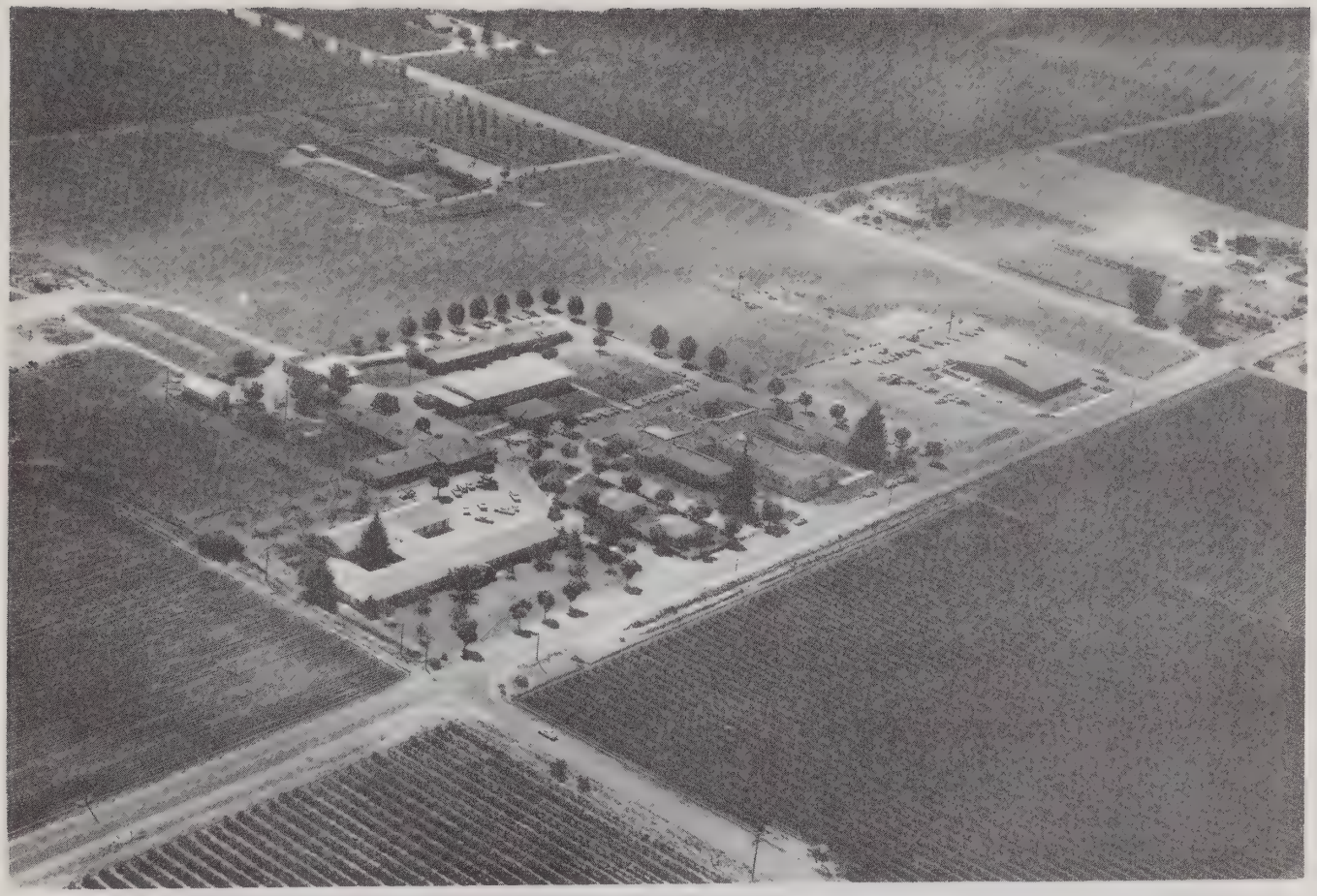
The 26,332 acres of vacant land shown in Table 1 is almost seven times the amount of land now in residential use, and eighty times the amount of existing commercial land use. Even public roads and railroads in the County use a comparative 15,568 acres.

Private holdings within the National Forests are classed as vacant in this report where they are not used for residence or some productive use. These amount to 8,960 acres of vacant land. This leaves 17,372 acres, consisting almost entirely of vacant residential lots.

The specific planning problems associated with vacant residential and commercial lots within Chowchilla and Madera is discussed in the recent General Plan or General Plan Studies for those cities. In addition the Community General Plan Report for Madera deals in detail with the vacant land situation in the unincorporated area surrounding that City.

The sub-category of "All Other" vacant land in Table 1 refers primarily to the small,older, unincorporated communities such as Raymond, Fairmead, etc. In these communities, the vacant residential and commercial land situation has generally remained stable for some time, with no appreciable amounts of new land being removed from other uses.

It is particularly in the more recent (1953 and later) residential subdivisions that great disproportions exist between the acreage of residential lots *in use* and the *vacant* lot acreage. For example, out of the 10,846 such lots in existence in April, 1967; 9,749, or 90%, were vacant! In terms of acreage, the percentage vacant is even more striking; 95.4% vacant acreage.



Institutional uses such as the Madera County Hospital, welfare building, and juvenile hall, shown in this photograph occupy less than one tenth of one percent of the total area of Madera County. However, these public uses provide some valuable open space in an area nearby the expanding urban uses around the City of Madera. As these public use areas are included in the evolving metropolitan area of the City, they will provide some open space relief in the context of the developing residential lots.

R.L.W.

Here is an example of an extremely sophisticated modern electronic device that depends specifically upon the adjoining open space in order to function properly. This is a V.O.R. omni-range station. It generates electronic signals which allow aircraft to navigate. The construction of any buildings nearby, or even the significant modification of the terrain or the introduction of a new lake nearby can have a drastic effect upon the operating efficiency of this very expensive and very important device. Thus it is apparent that not only natural systems and the local economy are dependent upon open space, but some of man's most recent and modern inventions depend upon it also.

R.L.W.

P.G.&E.

This plan for open space has been coordinated with the plans of the cities for recreational open space. This view of the Madera High School shows the need for open space in conjunction with the recreational and educational activities taking place here. Additional space in the lower portion of this picture is used by the school farm in conjunction with courses in agronomy and other agriculturally-related activities.

This situation is the result of the largely speculative activity during the decade of the '50's and early '60's. County land use policy and regulatory activity described in Section 4 of this report; Land Use Controls, has reduced this trend toward increasing speculative subdivision, and nearly stopped it since 1964. The disproportion between acreage of residential lots *in use* and *vacant* lot acreage can also be seen in the foothill and mountain subdivisions, but is substantially reduced when compared to those of the valley. Table 10 below presents data on subdivision lots and acreage, both *vacant* and *in use*.

In this study we have examined a wide range of factors which influence land use patterns in Madera County. Some of these influences are primarily of historical interest, or they currently affect land uses in only a minor way, while others have a key effect upon land use and are shaping the trends which will establish future land use patterns.

Even these active trends, however, must be viewed in a basic context of slow change, relative to other counties or regions of the State closer to metropolitan areas. This slow rate prevails in conjunction with the agricultural basis of this rural economy, with the large size of the County and *relative* isolation from present centers of population pressure.

Significant changes in agriculture, in turn, depend in the long run, upon national and international requirements, and in the short run, upon new supplies of water becoming available. Thus County growth is dominated by *extensive* land uses and is characterized by vast surpluses of limited use land, with much resulting wastage and marginal use of land.

One effect of this controlling background is to make personal experience of the overall pattern of land use very indirect, whereas people experience the effects of "micro-patterns" of land use, or changes in it, as having a far greater impact on their lives. These "micro-patterns" refer primarily to urban and smaller outdoor uses which affect the quality of life or affect the more directly effective visual and other senses.

Another effect is to sharply limit the influence which regulations have on broad land use patterns. At this stage of development in the County at least, the larger economic and technological factors (such as significant new supplies of water), will generally determine the pattern of extensive land uses, while local regulation tends to be more limited to controlling local "nuisance" elements of land use or "abuse".

Against this background, then, we summarize the key evolving trends and problems, along with some of the factors generating them as follows:

1. There will be continuing changes in the pattern of agricultural land uses characterized mainly by:

   a. Significant annual increases in irrigated acreage which will become substantial with the availability of additional irrigation water supplies. On the far east side, mich of this increased acreage is in citrus, or apparently is programmed for citrus.

   --We have observed that there is a sequence of agricultural uses whereby a less intensive one is preliminary to the more intensive, irrigated agricultural uses.

   b. Continuing declines in dryland grazing acreage on the west side and dry grain cropland acreage on the far east side of the valley.

   c. A continuing slow increase in average farm size and decrease in total number of farms.

   --In this connection, the problem of excessive division of farm land resulting in the eventual removal of lands from agricultural use is a key factor.

   --As this trend continues, it may eventually generate a problem of relative overbuilding of County roads on the old section-line grid in the valley area.

2. Continuing growth of residential resort - recreational land uses in the upper foothill-lower mountain belt along the edge of the National Forest. This development - probably the most dynamic and active land use trend in the County - is beginning to precipitate a host of planning problems and opportunities. In respect to these, then,some of the questions to which the County General Plan will have to address itself are:

   a. Suitable designs for subdivisions, etc. to complement the scenic environment, and avoid more, indifferent subdivision sprawl.

   b. Providing adequate supplies of domestic water, and protecting water supplies against pollution by inadequate or improper sewage and garbage disposal.

c. Devising adequate local area General Plans,so that the mountain communities will find it feasible to supply and expand public services and facilities.

--Positive steps in the provision of key transportation arteries, water supplies, sewers and other utilities along with restrictions on speculative subdivisions would probably redirect disintegrative land use trends in preferred directions.

3. Potential for resumption of speculative subdivision uses of marginal agricultural lands on the far east side and in the lower foothills remains.

a. The eventual need for a solution to the inherited problem of a vast surplus of empty subdivision lots in the valley area. The priority of this planning task is underscored by the more important effects of this situation.

--The older speculative subdivisions in particular show a severe deterioration in quality of housing intermixed with miscellaneous nonresidential land uses.

--A contradictory result of the vast vacant residential acreage in the vicinity of Madera is its apparent reverse effect upon the direction of urban residential growth. Such growth in the north (where most vacant lots exist), is practically nil, while the real growth has been to the west where virtually no speculative subdivisions were developed.

4. The total amount of land and water area in recreational use has remained relatively static, while demand for, and intensity of use of these lands has been increasing rapidly.

--In this connection, the potential for increasing available recreation acreage by applying multiple use concepts outside of the National Forests should be explored.

These are some of the conclusions arising out of an analysis of Land Use in Madera County; there are many more, of great variety. Each reader will find data that brings to mind problems and suggests solutions. The culmination of all of these studies and analyses will evolve in the General Plan Proposals that follow these reports. Then, the wishes of those citizens who are interested in the development of this environment will speak out in concert to thoroughly express their concepts of these problems and their ideas for resolution of them into the future.

Scout Island in Eastman Lake near Chowchilla is a small but important aspect of the recreation land in Madera County. Here a lake reservoir, necessary to the working of the Chowchilla Water District, is made available for recreational use to local groups. Service clubs and other interested townspeople have contributed both work and money to the development of these recreational facilities at this lake, originally formed for purely economic purpose.

P.O'R.

OPEN SPACE, TRANSPORTATION-CIRCULATION, AND CORRIDORS

The relationship of the existing road pattern in Madera County to the need for scenic corridors as a part of an open space concept, form a very natural relationship here. Many of Madera County's roads are naturally very scenic routes. It appears that in most cases the simple enforcement of existing zoning laws regarding the placement of signs and the prohibition of wrecking yards and other commercial establishments according to the specific zoning requirements would tend to maintain these scenic routes.

An earlier portion of this report indicated that nearly 2% of the County was occupied by road right of ways. Although this is a small number, it is obvious that the lands immediately adjoining these public right of ways are very important from the point of view of providing open space corridors throughout the community. It is these areas that are most seen in a most intimate way by the travelling public. Thus perhaps as little as 5% to 10% of the County lies within an intimate viewing distance of the public roads. These narrow strips have the greatest impace on the greatest number of people, and people travelling these roads have no choice but to look at whatever is there. Thus it seems important to maintain as good an appearance along these right of ways as is possible with existing regulations.

In a few pages there will be a discussion concerning existing road regulation and the mechanism for the provision of right of way in new developments as well as certain zoning and setback controls along the road pattern. Thus the mechanism for maintaining a pleasant aspect in an open nature along the public road system is already available for use.

Opportunities for Corridor Open Spaces

New opportunities for open space and scenic values in conjunction with the construction of new interchanges along Highway 99 in Madera County are now presenting themselves. If the County or the local community near which the exchange is located will agree with the Division of Highways to maintain the landscape materials, the Division of Highways will landscape the interchange areas subsequent to completion of the physical facility.

Drainage Systems - Opportunities for Corridors

New developments with better drainage facilities and new subdivisions and agricultural developments with levelling, irrigation, and drainage facilities are creating new aspects of drainage problems. Occasionally new easements for drainage right of way are required. Some of these drainage facilities present an opportunity for enhancement of wildlife habitat and corridors of open space that may lend themselves to riding and hiking trails in the future. These opportunities will present themselves in conjunction with new development in most cases; however, on Madera's far west side there new exist several major drains on public easements or rights of way across privately used lands. Some attempt has been made in the past to obtain public access ways along these drainage corridors, however, these attempts have not yet been very successful in establishing such corridors.

Canals and Corridors

Water transport by means of a system of canals and making use of existing streams in Madera County provides yet another opportunity for corridors of open space to be generated and maintained. The transport of water is a vital and significant part of transportation in Madera County. Not all transportation and circulation studies include this factor, but here in Madera County it is necessary to report on the transport of water in the vast and complex system of canals and sloughs of the various water districts.

The backbone of the water transportation system of the County is the Madera Canal of the U.S. Bureau of Reclamation's Central Valley Project. Beginning at Friant Dam, the canal proceeds easterly across the County for 36 miles to empty into Berenda Slough. This man-made watercourse as well as the Fresno River channel and several other natural and artificial waterways serve as westward flowing main distribution arteries. The main Madera Canal occupies 1785 acres of largely dry, foothill land. It traverses mostly open cow country.

The water from the Madera Canal is distributed almost entirely in the area west of the Santa Fe Railroad tracks by means of the canals and lateral network of the Madera Irrigation District and the Chowchilla Water District.

In addition to Central Valley Project water from Friant Dam, a considerable quantity of natural flow from the Fresno River and the Chowchilla River drainages east of the canal is utilized in the two irrigation district systems.

Flood Bypass Corridor

One other water transport feature on the landscape, that is the Lower San Joaquin River Flood Control Bypass, might be referred to as a"seasonal element" since it is designed to convey winter and spring flood releases from the San Joaquin River channel to the delta.

Moving waters of the canals and the land used for the canals provides a pattern of scenic open space corridors throughout the valley portion of the County. A number of these canal routes could well become the sites for riding and hiking trails, providing the details of liability and coordination could be successfully overcome. In one respect, these canals act as barriers to new roads in that they require new bridges, and perhaps in that way function to retard proliferation of the road net which, in turn, has often had the effect of spreading urban uses into the hinterlands of the cities. Urban families generally regard the canals with fear in terms of the possibility of drowning accidents and special precautions in urbanizing areas are required.

Lack of "maintenance" along the natural stream portions of the canal system usually result in a very scenic proliferation of wild flowers and the maintenance of some wildlife habitat. In general, "maintenance" of the constructed canal system eliminates any growth and consequently significantly reduces the ability of the canal system to support wildlife elsewhere in the County. Some fish exist on a rather tenuous basis in the canal system and crayfish and frogs abound, especially in areas where vegetation is allowed to grow.

Opportunities for Open Space in the Communication and Power Network

Major power line corridors cross this County as in most regions of the United States today. Our major power transmission corridors cross the County paralleling Highway 99 and somewhat to the east of it. Along these major transmission lines there exists a corridor in which no structures may be erected beneath or near the major power lines. In addition, there are several main power line facilities that extend into the mountain area of the County and certain restrictions on construction of structures are maintained there also.

A corridor for above-ground and below ground transmission lines has been proposed in earlier elements of the General Plan of Madera County; however, no corridor exists at this time. The easement spaces beneath existing power line facilities provide some opportunities for corridor reservations in future Open Space planning.

A major drawback to allowing public use of corridors along these routes is the hazard from shooting and other vandalism of the facilities. It seems inevitable that some form of regulation banning firearms and restricting the corridors from use for campfires or similar incendiary operations will be needed, along with some form of public liability guarantees for the companies or public entities that maintain these corridors. In addition, there is some question as to the legality of the power, gas, telephone, irrigation, or other companies allowing the easements they have obtained, ostensibly in the public interest, beneath or above the lines, to be used for any other purpose, including a trail system. A major analysis of this potential for open space corridors should be accomplished, perhaps at the State level, or with the assistance of the State, in order to determine the feasibility and legality of the use of such right of ways or easements for open space and scenic corridors.

Some progress has been made in Madera County in a cooperative manner with the local Pacific Gas and Electric office in terms of the location of routes for major transmission power lines. The last such proposed route was reviewed by the Planning Commission and the Commission's recommendations for some minor deviations of route which would place the power line route beneath or around the crests of major scenic hills along the route were recognized by P.G. & E. and some adjustments were made. By not transecting the crests of the hills and ridges but rather, staying just off to the side so that the silhouette of the poles and lines does not extend above the natural silhouette of the landscape a nearly "invisible" transmission line is created.

Hilltop Towers

Despite a requirement in the Zoning Ordinance that the site plans of certain public transmission facilities be reviewed by the Planning Commission and, in some cases, a requirement exists that they obtain a Conditional Land Use Permit first, a number of transmission and receiving towers have been constructed on high points in the foothill and mountain region of the County. In several cases, these installations are illegal in terms of the Zoning Ordinance requirements. There apparently has been a reluctance on the part of local government to pursue the issue. Continued proliferation of such hilltop receiving, transmitting and relay towers can do much to destroy the visual effect of the open space otherwise existing there. Joint use of certain sites might well be promoted locally and by the F.C.C. (Federal Communications Commission).

R.L.W.

New highway interchanges have intrinsic beauty and, if the local community will agree to maintain the plantings, the Division of Highways will install landscape materials at these interchanges in order to beautify the open areas necessary for safety, for vision, and for ponding of drainage waters, as well as being a part of the geometric requirement of the design. Thus local cooperation with the Division of Highways can produce more beautiful open areas in conjunction with these interchange lands in places that are seen by a great number of people each day.

The sandy bottom lands along the floodways of streams and rivers in Madera County provide long, unofficial recreation corridors during the dry months of the year. These sandy floodways also contribute great quantities of water to the underground water supply. The meandering, low velocity waters moving over these porous sands filter down to replenish groundwaters increasingly pumped for both urban and agricultural purposes. Private ownership of these floodways in many cases limits recreational use of them; however, existing open space and public open space zoning categories limits the use of these areas to recreational or agricultural enterprise for the most part. These floodways provide a valuable corridor system of open space within the framework of the County.

P.O'R.

R.L.W.

Airports provide open space for multiple uses. The Madera Airport provides an important base of operations for agricultural flying. Commercial, charter, and sport flying also use this place, and flyers of radio-controlled model planes use an unused runway for their recreation. A local drag-racing club uses a spare runway and local hunters work their dogs and hunt upland game birds here while a local rancher grazes cattle in fenced areas. Such multiple use makes an airport a good and useful open space.

Airports as Open Space

Currently airports in Madera County are enjoying some multiple uses as recreation and open space sites. Most airports in Madera County serve a very important economic cause by providing the base of operations for agricultural flying. More than 5,000 flying hours are expended each year in aerial applications from these airports. In addition, a number of other commercial transport functions are carried out and charter services, forest fire control, and a few other commercial enterprises occupy these airports.

The airports provide a very important open space function. Local citizens do make use of the airport at Madera as a place to fly radio controlled model airplanes, for drag racing on an unused portion of the airport, and for upland game bird shooting in season, running dogs and grazing cows, as well as a base for sport aviation. There is a need for more public and private airstrips and airports, particularly in the foothill and mountain region of the County, to provide for thorough coverage for air transportation and for various services carried out by means of aircraft, as well as recreational flying and for flying to the recreational sites in Madera County's mountain region.

A recent cost-benefit analysis, funded by the Economic Development Administration, analyzed a proposed mountain region airport for Madera County. That analysis, using very conservative techniques, estimated an over 9 to 1 return on the investment for the construction of such an airport. The principal use of such an airport would be for quick access to available public recreational facilities in the National Forest and to Yosemite National Park above Oakhurst.

In the Circulation and Transportation Element of Madera County's General Plan, an airport is planned to be constructed above Oakhurst on a geographic feature called Allen's Ridge. This airport would be constructed so that approval by the Federal Aviation Agency and the State of California Aeronautics Commission could be had for those facilities. Preliminary locational plans at two sites in the mountain area have been submitted and approved by the State Aeronautics Commission.

A site at Malum Ridge was approved with the stipulation that the old Bass Lake Airport would not also be approved since the traffic patterns of these two airports might interfere. The Malum Ridge Airport is currently under construction near the south end of Bass Lake, just north of the community of North Fork.

The Allen Ridge Airport above Oakhurst is still considered a possibility. The airport proposed on Allen Ridge would provide a significantly useful access to the Yosemite National Park and the many campgrounds and recreational facilities in the mountain region of the County.

Regional Significance

A principal finding of the Circulation and Transportation Study of Madera County indicated a very high use of Madera County's major traffic facilities, principally the State highways system, by out of County users coming to Madera County for participation in recreational activities and for visiting the U.S. Forest and Yosemite National Park. Thus once again the regional significance of Madera County as a recreational site being sought by persons from outside the County, and indeed from outside the State in many cases, was found. This indicates once again that certain regional economic assistance to the County might be forthcoming in proportion to the value to the County as open space within the region, within the State, and within this region of the United States.

The Circulation and Transportation Study also indicated the great value of the circulation system to the agricultural and recreational industries; that is, the economic base industries of Madera County.

More importantly, we recognize the power of the road system to open up lands for new uses and for further divisions for sale or speculative holdings or as homesites. In terms of open space conservation, that function can be considered to be negative.

Visual Factors

We also found that the public roads can be an attractor of excessive signs and of obnoxious accumulations of junk, usually resulting in a grouping of visual factors along the road that is generally felt to be detrimental to good community development and to sustained land values.

The Circulation and Transportation Study also found that driving is, to a great extent, a recreational enterprise for many people in Madera County; that although there are no parkways, so called, in Madera County, there are many roads which are used for recreational driving and are enjoyed much as parkways are enjoyed in more urban areas. The provision of parkways might be strongly considered in future road planning in Madera County.

Finally, we found that the road net, although occupying a very small proportion of the total area of Madera County, provides visual access to most of the people travelling about here, and therefore makes it imperative that the corridors along these major thoroughfares be maintained in as fine a visual condition as is possible, utilizing existing regulation and control in the public interest.

HOUSING AND OPEN SPACE

As has been the case with so many other factors related to open space, the housing aspect of the matter is one which has both positive and negative aspects with regard to the provision of future open space.

First of all, we must be concerned that major projects for the generation of new housing in the community areas of Madera County is accompanied by the provision of appropriate size and appropriately located open spaces in conjunction with the additional residential development.

Some counties in the San Joaquin Valley of California have already embarked upon implementation programs to carry out policies which tend to encourage the development of the existing larger, urban centers of the counties and, on the other hand, allow the dignified demise of what are termed "non-viable" communities. The concept holds that public investment should be directed toward those communities that can more efficiently provide the basic services to the public and which will tend to minimize the characteristics of urban sprawl throughout agricultural areas. The concept does not contemplate the elimination of existing small rural grocery stores, taverns, and service stations that are important commercial service functions for the local agricultural operators. It does, however, tend to direct new development, including major commercial functions and most new housing developments, into the urban areas.

Thus, where zoning regulations and land division regulations tend to mitigate against the spread of urban and suburban uses into the agricultural hinterland, certain other policies tend to encourage the development of efficient housing and public service functions in existing urban centers. In this way, the public's money is invested more wisely and more efficiently while the negative impact of sprawl throughout the agricultural communities can be minimized. From the point of view of providing open space in the future, it is more likely that the efficiently designed and developed urban and suburban developments nearby urban centers can more easily and more economically provide the required recreational and open space necessarily adjuncted to these places. On the other hand, the incipient sprawl and the casual division by lot splitting of parcels of property throughout the agricultural area of the County leads to eventual accumulations of dwellings and commercial functions having little or no relation to the agricultural need; in fact, usually interfering with it.

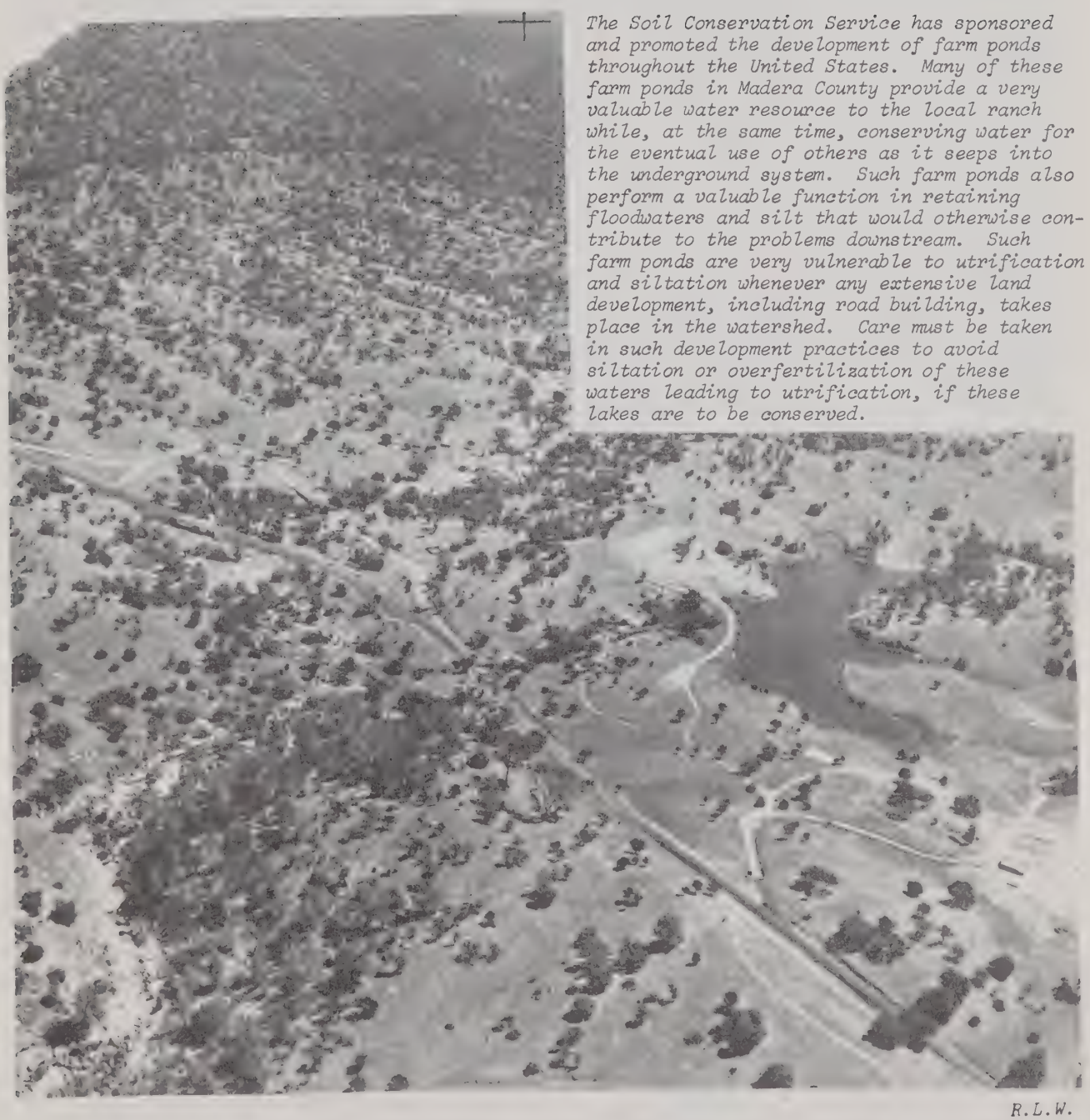
In stating the goals of a local housing program, the Housing Study of Madera County said that one of the goals should be to prepare the fringe communities to become a part of the cities. Secondly, there should perhaps be some effort to eliminate rural slums in some cases or to rebuild them in others. There should be consideration of the potential for relocation of some communities, if they are no longer efficient in that place. Another possible community goal for Madera County could be to generate some new towns and satellite cities. These would be coordinated with Federal projects to decentralize major metropolitan areas to this region.

Conservation of Open Space/Better Economics

In our analysis of changing land uses in Madera, we found that there are fewer operating farms and that the farm units are becoming larger in size. We found in the Economic Base Study of Madera County that when the economic health of agriculture is good, there is a lessened opportunity for outside land speculators to purchase farms and ranches for speculative subdivisions. Thus, when farms enter the Williamson Act contracts with the County, resulting in lower tax assessments in return for a contractual agreement not to divide the land or to use it for urban purposes, there is a very real conservation of open space involved.

During the course of administration of planning functions in Madera County, the staff has encountered a number of development proposals that are often accompanied by the argument that this Country needs more housing and particularly, California needs more housing and therefore it is necessary to generate these subdivisions. One of the ironic facts of speculative subdividing in Madera County is that the very lots that were generated as a result of acceptance of this argument by earlier government officials are probably the very lots that are the last that will develop new housing. Developers of housing generally prefer to purchase the land and develop the entire subdivision, including the housing, rather than to build houses on the expensive speculative lots already generated. Thus the development of new housing in the Madera region has taken place on lands subdivided by the builders and virtually no development has taken place on the speculatively divided lots.

The Housing Study also indicated a significant increase in housing in the foothill and mountain areas of Madera County, occupied by permanent, retired persons or by persons engaged in service activities in the mountain area. Most other housing in the County is replacement housing and some increase in housing over that generally thought to be necessary for a fairly stable net population indicates some "undoubling" of families and, in the case of the census count of housing, indicates a change in the definition of dwelling unit in the past two decades to include more structures previously not counted.



The Soil Conservation Service has sponsored and promoted the development of farm ponds throughout the United States. Many of these farm ponds in Madera County provide a very valuable water resource to the local ranch while, at the same time, conserving water for the eventual use of others as it seeps into the underground system. Such farm ponds also perform a valuable function in retaining floodwaters and silt that would otherwise contribute to the problems downstream. Such farm ponds are very vulnerable to utrification and siltation whenever any extensive land development, including road building, takes place in the watershed. Care must be taken in such development practices to avoid siltation or overfertilization of these waters leading to utrification, if these lakes are to be conserved.

R.L.W.

R.L.W.

Recreation at Lake Maaera. Efforts are being made to improve the recreational capabilities of this lake.

Fire Hazard

A large proportion of new homes constructed in Madera County in the past few years have been constructed in the mountain region. More people are moving into these wildland areas in both permanent and mobile homes. Many homes, cabins, and recreational areas and businesses are being located in high fire hazard areas. There is a two-fold danger. First, there is increased risk to watershed resources and an increased threat to human life and property. Local and State fire authorities claim that urban land uses cannot be properly developed, even to suburban standards, without the adoption of fire safety measures by planners and developers.

Present regulations stipulate that a fire break must be maintained for a distance of not less than 30 feet around the structure or to the property line, whichever is nearer. This requirement does not apply to single ornamental trees or ornamental shrubbery. In extra high hazard areas, the fire break areas may be extended up to 100 feet, if it is required by the State Forester. Grass less than 18 inches high may be used to stabilize the soil, but it is advisable to attempt to keep this grass green throughout the fire season by sprinkler irrigation. Well irrigated succulent, soil-holding plants are also recommended. Portions of trees within 10 feet of a chimney or a stovepipe must be removed according to these regulation. All dead wood must be removed from trees that overhang any building. Roofs must be kept free of leaves, needles, or dead vegetation. Any chimneys or stovepipes must be covered by screens with openings not larger than 1/2 inch in size; however, a 1/4 inch mesh is recommended.

Additional safety measures include the provision of roads and highways for mobility out of an area in the event of a forest fire. Road networks should provide for alternative escape routes. (All subdivision plans for developments in mountain regions are submitted to the State Forester for review with regard to fire hazard and, in particular, are reviewed for the provision of alternative escape routes out of subdivided areas.)

It is recommended that vegetation be removed for at least 10 feet on each side of travelled sections of these roads. It is suggested that all recreational developments have planned access and escape routes, hazard reduction, and extra water stored for emergency fire use. The additional water supply should be accessible by road, since motorized pumping units are used by the fire service for fire suppression work. Hazard reduction includes the establishment of greenbelts around recreational developments. Further, to facilitate the location of fires from rapid descriptions given in emergency and the location of all roads, streets, and buildings should be clearly marked and any road signs or other identifiers should be visible from the main travelled roadway. Deadend streets and roads should be specially marked. In this respect, it is important that the County's road numbering and house numbering system be observed.

Perhaps it is not surprising that it is recommended that developers of mountain area subdivisions and other kinds of developments should use fire resistant materials for road construction. Screens are recommended to apply to any openings in roofs, attics, or soffits. Fire resistant construction is recommended for all balconies, decks, and in unenclosed areas found on stilt or cantilevered homes. This is particularly important in the underside which is often not treated that way. Special consideration should be given to minimizing inflamable materials near large window surfaces which face fire hazards, since in the event of a fire, radiated heat from burning materials would almost certainly burst the window, allowing inflamable materials on the inside to become ignited.

Thus it is possible to see the value of localized open space and careful planning in new developments in the foothill and mountain regions of the County.

Weed Control and Fire Related to Open Space

One problem of the maintenance of open space within developing areas is that of weed control for fire prevention. Madera County has several ordinances concerning the condition of premises. One ordinance with the aim of weed control and fire prevention states that owners are responsible for each and every parcel of land adjoining a public highway. Such owners are compelled by this law to systematically and periodically remove weeds from these lands, particularly as they may become a fire hazard. Certain abatement procedures are possible. Thus it can be seen that although open space is generally positively valued, it can be seen here that there is a negative aspect involved in the maintenance of open space.

Large Lot Zoning

Another aspect of open space that should be considered is the impact of the large lot requirements of Madera's health and zoning ordinances. For very good reasons, including space for the provision of septic systems and for minimizing the density of development in certain areas of Madera County, the health and zoning ordinances require minimum one acre lots. This minimum acreage requirement applies where public sewer and water systems are not available.

There is a cultural habit of land use, however, that tends to negate the potential effect of providing each dweller with his own private, large open space in conjunction with the homesite. The Land Use Survey of Madera County has found that most people tend not to use more than about 1200 square feet for lawn and immediate yard area around each dwelling. On the other hand, the basic requirement for one acre minimum lots in the rural, hinterland areas results in an excessive amount of property sometimes being required to meet the lesser, culturally-related space requirements of families here. The most likely result of an excessive size, non-agricultural lot in Madera County is the generation of a minor junk pile. It is almost a maxim of planning in this part of the country that "if there is no good use for a piece of property, it will be put to a bad use".

One of the most effective methods of lowering the appearance of the environment in many parts of Madera County today is an accumulation of junk in the yard of the house. In most of the rural area of Madera County, there is no organized private or public junk pickup system. It is anticipated that each person will take material that he wishes to discard to the County disposal site situated near Fairmead. Many people do not do this. On large ranches and farms, there is usually some little slit trench somewhere around the property into which garbage, trash, and small items are dumped, and (sometimes), later covered. Larger junk materials, such as old automobiles and trucks, farm implements, old house trailers, and other kinds of large materials often accumulate on the excess property.

There appear to be many reasons why people follow this cultural habit. Many of them are good reasons. It is obvious, however, that a more efficient use of the land, not providing residential lot sizes much larger than that which the cultural land use habits of the public here requires, would go far to reducing this misuse of the excessively-sized lots.

Essentially, this argues that public open space and recreation areas should be provided within more efficiently developed subdivisions. These subdivisions, of necessity, would have to be supplied with sewer and water services. It appears that smaller lot sizes, yielding greater numbers of lots, would allow developers to afford these basic public facilities and open space in their developments. In addition, by more closely meeting the cultural demand for smaller residential parcels, the accumulations of junk on excess property would be minimized.

This might indicate that it would be wise to have zoning and health laws which would require either urban size lots with sewer and water, or very large lots, suitable for agricultural use. It is apparently the "in-between" lots that are creating the greatest problems with regard to accumulations of junk on the property and a waste of land.

BOUNDARIES AND REGIONS

Earlier work on materials leading to Madera County's General Plan elements of Land Use, Recreation, Transportation, and Housing reviewed the boundaries of various State, County, City and local district areas. In addition, that study reviewed some of the mechanisms of these service areas.

It appears that in large residential subdivisions proposed in the future, it might be wise to require the formation of districts which would maintain open space and recreational facilities within that service area. This recommendation is contained in the concluding materials of this plan element.

Major Regional Recreational Areas

A very generalized proposal was conceived by the Planning staff approximately two years ago but has not been presented at public hearing, nor is it seriously considered by local officials at this time. The proposal suggested that some large metropolitan area such as the Bay Area Region of California, might need a large regional park facility somewhere outside of its boundaries. In the light of that possibility, it was suggested that a very large portion of Madera County's foothill region might be acquired by purchase by such a regional recreational district. Subsequently, certain aspects of land use and ownership would be returned to the existing property owners so that they could continue to occupy the land and to operate cow ranching functions much as they do now. The recreational district would allow members of its constituency to visit the large area free of charge, however, paying for such a function through a small tax in the metropolitan area.

The local tax base would be supported by a payment from the metropolitan recreation district in lieu of local property taxes to voer the negative impact on tax base otherwise generated. The recreation district would provide park rangers, directional signing, public protection, and road maintenance and improvement as well as parking areas, picnic areas, and similar facilities at points of interest and overlook sites.

P.O'R.

The importance of Bass Lake to the local recreational economy is nearly immeasurable. Traffic counts and other measurements have indicated that as many as 50,000 people may visit this lake during a long summer weekend holiday. These indicators also show that nearly 20,000 people may be in the area at any one time during these intensive recreation days at Bass Lake.

Sheep grazing was one of the earliest agricultural activities in Madera County. Today these sheep are providing a valuable service by clearing weeds and fire-dangerous growths of grass from large, unused speculative subdivisions nearby the City of Madera in the eastern portion of the valley.

R.L.W.

P.O'R.

Old and historic things form an important part of the scenic and recreational aspects of open space in Madera County. The importance of historic sites was recognized in the Madera County General Plan and the coordination of this Open Space Plan with the historic requirements of the General Plan is required. Many historic buildings or features in the County require only small parcels of property in order to preserve the sites.

The quiet beauty and natural detail of the rocky foothills in Madera County have great attraction for urban people who find great recreational opportunities from merely visiting such an area. The conservation of the agricultural activity in the foothills of Madera County will do much to conserve such quiet scenes. Presence of these things in turn will continue to bring contributions to the local economy from the recreational commerce associated with it.

P.O'R.

The proposal may not seem quite so far-fetched if it is considered in the light of comparison with the lands used by the City of San Francisco for the accumulation of waters in the Hetch-Hetchy Reservoir and transmission system. There, a remote metropolitan area acquires its drinking water by essentially the same means of acquiring principal development rights on a great area of land while allowing certain limited use by the public in that area.

The "Foothill Region Park" concept expressed here attempts to build in the answers to some of the objections otherwise raised to public recreational use of lands in local counties and communities. Despite the workings of the Williamson Land Conservation Act to preserve some lands in open space uses and agricultural activity, the staff considers that there is virtually no known mechanism available at this time to save any of the Central Valley Foothill Region from eventual subdivision into recreational and speculative lots. The destruction of the savannah ecological system along the foothill region appears inevitable unless some major mechanism such as this proposed "Foothill Regional Park" concept is applied. The concept once again emphasizes the regional nature of the open space available in Madera County.

R.L.W.

The Savannah; a park-like grazing land ecological system in the Upper Sonoran life zone in the foothills of Madera County. Grazing cattle are an important part of this life system.

REVIEW OF EXISTING GENERAL PLAN

LAND USE

TRANSPORTATION & CIRCULATION

RECREATION

HOUSING

EXISTING GENERAL PLAN ELEMENTS

The Board of Supervisors of Madera County in 1966 ordered the generation of a General Plan for the County, to include elements of land use, recreation,transportation and circulation, and housing, expressing problems and their desires to correct some of these problems and to prevent them in the future. They said that:

- Orderly growth was needed and some direction and guidance by government would provide that orderliness.
- Resources needed to be developed and employment increased.
- Improvement in housing and living quality was needed.
- There were increasing demands for public services.
- Poor choices of land use were being made.
- Government decisions needed to be made on major public capital investments and services.
- Specific areas and programs for recreation were desirable.
- More attractive surroundings were desired.
- Government efficiency was desired.
- General deterioration of the community was observed.
- Space was lavishly being used up.
- Open Space areas were desired to be conserved.
- Some improvement of traffic and circulation was needed.

Many of the expressions of the Board indirectly recognize the need for open space planning for note several of their policy statements that "space was lavishly being used up" and "open space areas were desired to be conserved" as well as "resources needed to be developed..." and "specific areas and programs for recreation were desirable", and "more attractive surroundings were desired". These are all specifically related to the need for open space planning and action to conserve open space.

Thus this Open Space Plan Element must abstract from the initial General Plan of Madera County those expressions of concern and methods of implementation proposed then. This plan element will then go forward with somewhat more specific statements evolved from policy statements earlier generated in the study program leading to this element. In that earlier plan preparation, the words of the former Secretary of the Interior Stuart Udall were quoted: "The way a people possess the land they live on is always a revealing comment on their character and institutions". Many people in Madera County have come here for the purpose of enjoying the open character of the place and engaging in recreational activities in these large, open areas. Further, many people enjoy simply working in a place that is not so crowded as the more urban places in California and the United States.

It appears then, that until a critical need arises to spread out the urban places more, over the land, this County, with a virtually stable population needs to seek quality more than quantity in the development of its lands for urban purposes. This quality should be sought in the context of the agricultural and recreational basis of the local economy. It would simply be poor business and unrealistic to continue to sprawl urban and suburban uses over the agricultural lands when in fact the population of the County is nearly stable and in view of the avowed interests and wishes of the people to continue to enjoy the open nature of the place in the future.

These General Plan statements relating to the Open Space Plan Element are reiterated here and will be combined with those new general plan statements specifically generated by this General Plan Element. These statements are based upon information contained in the previous materials in this study and plan element and in the seven basic studies of Population, Land Use, Natural Resources, Economic Base, Transportation and Circulation, Housing, and Boundaries and Regions, which preceded the generation of the first four elements of the General Plan: Land Use, Recreation, Transportation and Circulation, and Housing.

Parkways

A proposal for State parkways in Madera County is made in the California State Parkways Plan. Thus, in Madera County a parkway is shown paralleling the San Joaquin and Fresno Rivers, beginning in the upper left corner of the map of Madera County, near the

intersection of Road 1 and Avenue 20 and proceeding southward along the floodways associated with the San Joaquin River, to the intersection with the Fresno River where it then follows the north side of the Fresno River all the way to the City of Madera, deviates to Cleveland Avenue, and again returns to the north side of the river at the intersection of Cleveland and Tozer. At that point, it follows the Raymond Road to a point northeast of the Santa Fe tracks, then proceeds on the north side of the Fresno River, up the Fresno River course on the north side, past Lake Madera, to Equalization Lake and Hidden Dam.

At Hidden Dam, the route crosses the bridge to the south side of the Fresno River and continues on toward Coarsegold, along the alignment of the River Road and the Raymond Road. The parkway again appears above Oakhurst, swinging around the Forest Service road on Thornberry Mountain to Bass Lake, along the southwest side of Bass Lake, across the new bridge crossing on the south end of Bass Lake, then follows the existing road through Central Camp and Beasore Meadow. At Beasore Meadow, the parkway divides into two major portions; one a large loop extending on out through the Upper Chiquito Campground, Jackass Meadow, Miller Meadow, Curry Meadow, and then returning on the Mammoth Road near Jackass Rock Family Campground to an intersection with the other section of the parkway which proceeds directly south from the Beasore Meadow to the intersection of the Mammoth Road near Soda Springs Campground. The two parkways again join at the intersection of the Mammoth Lake Road and the Mammoth Road. The parkway then proceeds south to Mammoth Lake Campground and crosses Mammoth Dam to the Fresno side of the San Joaquin River.

Scenic Drives

In conjunction with this parkway, some scenic drives are designated in the General Plan. One of these is on the River Road to a point just below Hidden Dam and then proceeding along the Bates Station Road to Kelshaw Corners. Another scenic drive begins just about Four Corners, at the intersection of Highway 41 and Road 208, (22 Mile House), and proceeds to the Belleview intersection, making a large loop up through several large ranches below O'Neals and back to the Belleview intersection, then south to the Friant crossing of the San Joaquin River, below Millerton Lake and Millerton Dam.

The other designated scenic route begins at a position at the intersection of Avenue 21 and Road 28½ , (the Raymond Road), and proceeds north to Daulton, east to the Raymond Road, north to Raymond; there dividing into two parallel routes which join again just below Grub Gulch. The scenic route then follows the Ahwahnee Road through Windy Gap to an intersection with the Golden State Highway at Ahwahnee. These scenic roads are existing pavements today and require only the control of signs and certain commercial and industrial occupations of land adjoining these roads to maintain their scenic status.

Eastside Canal

Another major use of land proposed in the General Plan that is not in existence today is the Eastside Canal, in its approximate future location northeast of Highway 99. The canal would enter the County just northeast of the Santa Fe Railroad tracks, at the County's northern boundary, then proceed along an alignment dictated by land availability and topography to its terminus at Fig Garden Lake, below the Bluff Area on the south side of Madera County and immediately adjoining the Santa Fe Railroad tracks at that place. (The Eastside Canal is mentioned here because of its impact on providing water to maintain extensive lands in intensive agricultural use as an alternative to speculative residential and commercial subdividing.)

Residential

No significant new residential areas are planned in places outside of the small community plan areas of the County in this General Plan in the valley area. Those places shown in the Plan as Rural Residential Areas outside of the small community areas are existing subdivisions where there appears to be little hope of reversing the apparent premature division of land.

In the mountain region of Madera County, however, several areas outside of the small community plan areas are shown as potential places for residential expansion. (This statement of the initial General Plan for Land Use in Madera County is reiterated because of its relationship to the Open Space Program in the future in Madera County.)

Recreational

Three large new lakes are shown on this plan of land uses, including the area around Buchanan Lake, Hidden Lake, and the Bluff Area where Fig Garden Lake is proposed to be formed. Fig Garden Lake is explained in more detail in the Small Area Study and Plan for the Bluff Area.

The Hidden Lake and park facility will occupy approximately 9 sections of land and the Buchanan Lake and adjoining premises approximately 8 sections of land. Detailed planning and engineering for these lake recreation areas is being accomplished now by the U.S. Corps of Engineers in conjunction with their plans for the development of the dams and lakes. These dams have now been funded for initial construction.

Other significant recreation areas include an expanded area for Millerton Lake State Park, utilizing Burea of Land Management lands upstream from the present park area and a proposed new park on the rough table lands around Little Table Mountain. This park would be called, "Little Table Park" and would serve a regional recreational function. Another new park is proposed in the area of

Thornberry Mountain called, "Thornberry Mountain Park" and would utilize land not now occupied by the U.S. Forest Service in that area. Two other parks would be generated in and around the land used for Windy Gap Lake and Soquel Lake in conjunction with those water projects. The Windy Gap Lake and recreation lands are shown in more detail in the Ahwahnee Small Area Plan. A separate, detailed map has been included here to show some of the relationships of the Soquel Water Project to the North Fork-Bass Lake-Oakhurst-Yosemite Forks-Ahwahnee-Coarsegold communities. A rather extensive area around Soquel Lake would be maintained as a watershed control area and for some light recreation uses.

A major national park is proposed in the far eastern portion of Madera County, along the San Joaquin River, called the "San Joaquin River Gorge Park". This park would encompass some of the most magnificent views and interesting wild areas that this County has to offer. It would provide a park which, from a visual standpoint, would rival the views in Yosemite National Park, its principal difference from that geological feature being the narrow and rugged floor of the gorge. Modern technology and newer vehicles will make it possible for the general public to enjoy these views in this proposed new park.

Airports

This plan for Madera County includes planned locations for new airports in addition to the existing airports and airstrips. In general, the new airport proposals are for airstrips in the foothills and the low mountain area and two airports in the mountain area, adjoining the National Forest and Yosemite National Park. Each of these airports would occupy between 20 and 40 acres of land with the exception of the transport airport near Chowchilla discussed earlier, and the Allen Ridge Airport near Oakhurst where greater areas would be used. These airports are sited in places where there will be a minimum of interference with adjoining land uses. If the basic elements of the plan are followed, there will be little opportunity to generate conflicts in land uses between these planned airports and adjoining land uses. A total of 40 airports and airstrips are planned in this General Plan of Madera County. There are now more than 26 existing.

National Forests

This General Plan shows a certain adjustment of boundaries of the National Forest in the vicinity of Bass Lake, Oakhurst, and North Fork. These boundary adjustments are made in terms of the needs of competing land uses and in recognization of the emerging unsuitability of some of these lands for forestry use and operations. A specific plan for the readjustment of forestry boundaries in this area has been prepared by the U.S. Forest Service, Sierra National Forest.

The rest of the National Forest remains intact in this General Plan with the exception of the San Joaquin River Gorge Park generated out of a portion of the forest area there. Yosemite National Park and the John Muir Wilderness Area and the Minarets Wilderness Area, as well as Devil's Postpile National Monument, are reiterated within their existing boundaries.

Urban/Rural Uses

This Land Use Plan has, as a general theme, the concept of concentrating urban uses in existing urban community areas and thus minimizing the inefficiencies and the negative impacts on outlying agricultural lands where such urban uses can create severe interference.

The concept of green belts was explored in this plan. Essentially, the preservation of agricultural land use in the areas of the County not occupied by these small communities constitutes the generation of literal "green belts" or large green belt areas. In terms of land use, the open space and green areas are now available. However, more detail on the nature of the use of these lands for recreational purposes appears in the Recreation Element. This Land Use Plan, in conjunction with the zoning ordinance of Madera County will provide places for concentrated poultry and animal raising operations, as well as limiting these kinds of uses in certain areas of the County where past practices and existing trends have generated and will generate relatively dense rural occupancy. This recognizes the potential nuisance factors from the concentrated poultry and animal raising operations to adjoining dwellers. In general, the areas of least human occupance are those proposed to be utilized for concentrated poultry and animal raising. Such areas generally exist east of the Santa Fe Railroad and on tothe foothills of Madera County. Generally, southwest of the Santa Fe Railroad and certainly southwest of Highway 99 there are large areas of agricultural occupance where the density of individual homes on these farms and ranches is such that concentrated poultry and animal raising operations should be controlled through the use of Conditional Use Permits and a Zoning Ordinance.

Agricultural land use needs have been carefully maintained in this Plan, principally by providing specific places for uses other than rural. This General Plan is compatible with the trend toward larger, corporate-owned farms and yet provides adequate places for small, family-owned farms within its framework.

This General Plan provides for future land requirements for such new operations as Christmas tree farms in our foothill and low mountain and mountain areas and the introduction of new, more intensive crops in the valley portion of the County.

Multiple Uses

Land use in the foothill area of Madera County has been recommended from several sources to be generally proposed for multiple uses. Thus in the General Plan where the color for foothill and mountain uses of land is shown, is the general area of the County where multiple use of land for all suitable agricultural enterprises and recreational uses would be simultaneously carried on. Dude ranches, shooting preserves, fishing lakes, schools, and recreation camps are some potential multiple uses of this land. In most cases it is anticipated that these various uses would be carried out on large parcels of property where the various land uses would be self-integrating and conflicts would be minimized by the distance between centers of these uses. This foothill region will therefore serve as a watershed, a wildlife area, a hunting area, a recreation area, an area for dude ranches and recreation homes, as well as for its principal agricultural function of grazing land.

Appearance

Appearance factors related to land use are planned to be improved by the encouragement of procedures such as cutting weeds and stubble fields instead of burning them, thus improving erosion resistance, reducing both the ugly appearance of the lands and minimizing the pollution of air. More discussion of methods to improve the appearance of the land and the regulation of certain land uses tending to generate negative appearances are discussed in more detail in the Implementation Section of this General Plan.

GENERAL PLAN TRANSPORTATION AND CIRCULATION ELEMENTS RELATED TO OPEN SPACE

In the existing General Plan of Madera County, a Transportation and Circulation Element specified certain factors of development which relate directly to the Open Space Element.

Parkways

The State Parkway Plan, entitled "California Parkways" recently produced by the Department of Parks and Recreation of the Resources Agency of the State of California indicates a State Parkway in Madera County. This was described in the previous review of the existing Land Use Element of the General Plan.

Scenic Routes

Scenic routes were also described in the previous Land Use Element section. The scenic routes would be established over existing road right of ways and existing constructed roads with no new construction required.

Historic Names

The General Plan for Madera County contains new names for certain roads in the mountain areas of Madera County where they have been officially designated at this time. New road names in conjunction with the road numbers currently used are anticipated in the immediate future. The establishment of these road names utilizing historic names and other significant designations is considered to be of great value to the County's recreational economy in that area. It will also enhance the cultural heritage of the region.

Beautification

Roadside beautification was analyzed as a possibility for inclusion in the General Plan. At this time, the General Plan does not propose extensive use of roadside tree planting because of the very difficult local economic problems associated with irrigation of these trees in many areas. It is recommended, however, that when trees are removed from the roadside right of ways and irrigation is otherwise available, that the trees be replanted at new locations along the expanded or new setback edges of the wider right of way as a matter of enhancing the appearance of Madera County and its traffic ways. Stringent sign control along the designated scenic highways is also recommended. Because of their location adjoining major arterials in Madera County, beautification and improvement in the general appearance by fencing and edge plantings is recommended for State Highway yards and County highway yards where equipment and materiel are maintained. Electronic surveillance devices are recommended in order to allow the utilization of screen plantings and fencings around these yards.

The elimination of unsightly scribbling and paint sprays on rocks and trees along our major arterials is recommended. It is recommended that *sand blasting* be utilized to remove paing sprays and other marks from natural rocks along our highways, especially in the foothill and mountain regions. The current practice of painting some brown or grey paint over these symbols is not satisfactory and should be replaced by sand blasting away the symbols, initials, and names otherwise left under the thin, temporary coating of paint. A specific penalty and reward system should be established for the apprehension and conviction of vandals who create these public nuisances on the natural features along the roads.

Transport Aircraft Center

The details of the proposed Transport Aircraft Center will not be reiterated here. However, the important aspect to the Open Space Plan Element is that this airport is located in this position in this County and in this region specifically to avoid conflict with any densely populated residential land uses. It is therefore critically important

that very precise and very carefully implemented long-range controls to avoid the development of high density land uses nearby, and particularly on the ends of the main runways of this Transport Aircraft Center be avoided.

General/Agricultural Aviation

Similar relationships for maintaining low density land uses and avoiding residential or densely occupied areas nearby these airports, or especially off the ends of the runways, are important. The Transportation and Circulation Element also details plans for S.T.O.L. Airports as well, and certain open space requirements are related to such limited use airports.

Transportation Corridor

Also considered in this General Plan but not specifically shown on the General Plan map at this time is a proposal for a transportation corridor between the mountain and the valley regions of the County. A transportation corridor would make available for all transmission facilities - including pipelines, overhead and underground lines, as well as high speed transportation facilities - a protected specific corridor so that multiple, complex, and generally unrelated utility right of ways would not continue to proliferate in a disorganized fashion.

Dumpsites

A final consideration in the Circulation and Transportation Element of the General Plan is for the establishment of a dumpsite near each community. These are not shown specifically on the General Plan Map of the County. However, they are included here as a proposed General Plan factor, (current plans, based principally upon economic factors of transportation and cost of operation of sanitary landfills, propose only one major sanitary landfill site in Madera County, near Fairmead, at this time.

Recreation

Those materials related to the existing Recreation Element of the General Plan are included for specific reference to this Open Space Element. These points and plans will not then be reiterated in the Open Space Element specific list of implementation action factors but should be reviewed in context.

Lake Madera

Lake Madera County Park currently provides good fishing, although there has been a lack of development funds necessary for the comprehensive provision of trees and picnic facilities on the site.

There is a current problem of some leakage from the artificially created lake which requires that the water level be maintained at least five feet below the spillway level. Correction of this unfortunate problem could significantly increase the beauty and value of this lake for recreational purposes. The estimated use of this recreational lake in the spring and early summer season is approximately 600 visitor days/week. It is anticipated that this figure could rise to as much as 2,500 to 3,000 visitor days per week if the leakage problem could be corrected and some additional parking and picnic facilities provided, along with shade trees.

Federal Lands

Fully one third of Madera County is already Federally-owned land, capable of being used for certain recreational purposes. Yosemite National Park occupies a large region in the northwest corner of the County, while two wilderness areas occupy large areas of the mountains. These are the Minarets Wilderness Area south of Yosemite Park and a small part of the John Muir Wilderness Area in the southeast corner of the County, near the Devil's Postpile National Monument.

The United States Forest Service maintains a large number of recreational areas and campgrounds within the boundaries of the National Forest in our mountain area. Bass Lake provides the foundation for an intensive recreational use. This is a lake within the boundaries of the National Forest operated by Pacific Gas and Electric Company under the jurisdiction of the Federal Power Commission. Several other lakes on the San Joaquin River are operated for power production and participate in the flood control and irrigation projects along with their power producing function. Recreational facilities have been developed on some of these lakes and more are pending. It is safe to say that any body of water in Madera County has some kind of recreational use on it, whether allowed or not.

Private Open Lands

Recreational use of some of the open land in the middle section of the County is a rather indefinite thing and difficult to define precisely. However, great recreational enjoyment comes to many people who simply drive through this country to enjoy the openness, the wild flowers, the wildlife, the rolling vistas over the savannahs, and cleared lands in the grazing areas in the central portion of the County. In many cases, these activities are not popular with the land owners. Abuses by hunters and persons climbing through fences or otherwise damaging facilities associated with the cow raising operations have created some very poor feelings among some of the land owners with regard to formerly acceptable trespass.

There have been recent successes in the application of the Williamson Open Space Act resulting in agreements between property owners and the County of Madera to maintain certain agricultural lands in open space uses and for agricultural purposes. Many of these agricultural land preserves provide the foundation for possible future use as park areas. Whether or not used for specific parks in the future through public acquisition, these land preserve areas do contribute a recreational function to the public. Preservation of these lands in open space uses contributes to the preservation of the open nature of the environment and, of coufse, to the conservation of wildlife, water, and air. In addition, from an economic point of view, the County may then plan, in General Plans like this one, for the provision of urban-type services to certain areas of the County and, for other areas such as these land preserves, can assume that at least for the specified period of time, little or not new services will be required for the area as they remain in open space uses. Thus some economic efficiencies may accrue through the application of this knowledge to governmental services planning.

Canals

In the valley, at several points on the canal system used for irrigation, there are check dams and other facilities used for control of the irrigation waters. The small ponds or small lakes formed behind these facilities serve as unofficial swimming holes, although that use is neither officially allowed nor encouraged by the irrigation districts. Some of these facilities have water control devices which are dangerous to swimmers. The principal device which causes these dangers is the subsurface check valve. This siphons water from the lower levels of the reservoir and consequently poses the severe danger of pulling a swimmer into the gate because of the suction created by the outflow below the surface. The use of some irrigation waters for recreation in special, safe areas is recommended in this plan. An important hurdle will be to provide public liability coverage to relieve the irrigation districts of that burden.

Outside Sources of New Recreation

Certain recreation functions are proposed by agencies outside of Madera County. First, the U.S. Forest Service proposes a continuing program of expansion of the camping and other recreational facilities in the Sierra National Forest in the mountain region. Principal areas where this will take place are indicated on the General Plan Map of the County, within the Boundaries of the National Forest, Yosemite National Park, and the two wilderness areas.

The abandonment of the stewardship of certain Bureau of Land Management lands in Madera County has provided the opportunity to plan their use in some cases for recreational purposes. One of these areas is at Windy Gap, where a new lake and recreation area is proposed and which would make use of a large tract of Bureau of Land Management land in Windy Gap.

Another large tract of B.L.M. controlled land lies along the San Joaquin River, just east and south of Kennedy Table. The General Plan proposal for Madera County expresses the use of these lands for recreational purposes in an upstream extension of the Millerton Lake State Park land on the San Joaquin River. This is the highest and best use of this very rough, steep, and poorly vegetated land.

New Lakes

Five completely new lakes are proposed for Madera County in the near future. Two of these have been funded to a degree for engineering and fundamental planning at this time. The first of these is the Buchanan Dam and lake on the Chowchilla River in the north central portion of Madera County, approximately five miles west of the community area of Raymond. This lake would be surrounded by several sections of land developed for recreational purposes in conjunction with the lake.

Hidden Dam and Lake on the Fresno River, approximately in the center of Madera County, is a similar project which, in addition to the exact area required for the expansion of the lake, will be surrounded by some developed recreational land.

The third, in the southern portion of the County, extending nearly 13 miles upstream from the Santa Fe Railroad crossing on the San Joaquin River, is the proposed Fig Garden Lake. This lake is proposed to be part of the functioning system of the Eastside Canal. It would be filled by waters proceeding south in the Eastside Canal and entering at the downstream end of thelake. These waters would then back up to maintain a very steady level lake, (unlike many other irrigation lakes), to allow this water to back upstream to a point where it can be pumped up into the next segment of the Eastside Canal or allowed to fall to the south along the foothills in Fresno County. This long, narrow lake in the floodplain below the bluffs in Madera County's south central area is expressed in detail in the small area study and plan for the Bluff Area. Several recreation and park facilities are associated with that lake as well as a proposed parkway serving a dual function of access to adjoining lands and recreation facilities, and minor traffic facility for access to other non-recreational lands adjoining the lake.

It is anticipated that an entirely new recreational area will be able to be developed in the vicinity of the proposed Soquel Lake. This lake, to be developed as a water supply facility for some of the mountain communities of Madera County, would require a certain area of land surrounding it to be established for watershed control. Some light recreational uses will be allowed in that area.

An entirely new water-oriented recreational area is anticipated in this plan to be developed adjoining the Windy Gap Lake shown in the Windy Gap area near Ahwahnee. More detail of this plan proposal is contined in the Ahwahnee Small Area General Plan.

Irrigation Lakes

Recreational facilities exist now at Eastman Lake, operated by the Chowchilla Water District, and at Lake Madera which is filled by surplus waters otherwise normally assigned to the Madera Irrigation District downstream. This Recreational Element proposes the continued development of recreation facilities at Eastman Lake in cooperation with citizen groups in the City of Chowchilla and the Chowchilla Water District. Another government facility available for development, with recreational facilities adjoining, is the Equalization Lake on the Madera Canal, about four miles above Lake Madera and directly available from the State Parkway along the north side of the Fresno River at that place. In the meantime, other access may be developed by constructing the roadway adjoining the canal to the west of the Equalization Lake from the Raymond Road. Reconstruction of that roadway to better standards is required before it can be used as access to the area.

Parkways

The California State Parkway Plan proposes a parkway following the San Joaquin River to its junction with the Fresno River and then up the north side of the Fresno River through the City of Madera via Cleveland Avenue, again on the north side of the river above the City of Madera, along the south edge of the Lake Madera County Park and then on up the Fresno River to Hidden Dam. At Hidden Dam, the parkway would cross the Fresno River to the south side of the river and then proceed up the River Road to Coarsegold and Highway 41. Several miles toward Oakhurst from Coarsegold, the scenic parkway would proceed around the rim of Thornberry Ridge to Teaford Saddle, swinging around Goat Mountain to Bass Lake, along the south and west side of Bass Lake to the south end of the lake. At that point, the parkway would cross a new bridge over the stream between Bass Lake and Manzanita Lake and connect to the Central Camp-Beasore Meadow Road. At Beasore Meadow, the parkway splits into two segments; one a large loop proceeding out through Jackass Meadow, Miller Meadow, and returns along the Minarets Summit Road, (Mammoth Road), past the Jackass Rock Family Camp to a junction w with the Mammoth Pool Road. The shorter segment of the parkway would proceed directly south of Beasore Meadow to the Minarets Summit road, (Mammoth Road), and join there with the larger loop that returned along that road. From that junction, the parkway proceeds directly south across the dam at Mammoth Pool and on into Fresno County on the south. This is a State parkway proposal expressed in terms of the County's existing road pattern.

Coordination

These outside agencies are providing existing or ptential recreation sites in Madera County at this time, or plan for them in the near future. Their existence or plans have been expressed in this General Plan as a part of the Recreation Element in order to coordinate those functions with land use, transportation and circulation, housing, and other elements of the General Plan. Some planned recreation facilities have a more local origin and value, and will require more local effort in order to convince required outside agencies, necessary for coordination, that these are in fact viable proposals.

Snow Play areas

The Recreation Element of the Madera County General Plan includes a proposal for a snow play area near Highway 41, above Yosemite Forks and below the entrance to Yosemite Park. More specific plans for this proposed facility are available from the Recreation Commission.

A snow play area is recommended in this General Plan to be developed near Cold Spring above Bass Lake. This snow play area, similar to the one proposed near Highway 41, just below the entrance to Yosemite Park, would provide off-the-road parking and a simple sliding hill for use by children and adults in the wintertime. No elaborate lifts or ski areas are proposed in these places.

Jackass Rock Camp

Jackass Rock Camp on the Minarets Summit Highway, (Mammoth Road), is a specific recreation project now being developed in Madera County in conjunction with private contributors. Contributions of work and money have been made by many private individuals within the County toward the development of this project, and Madera County, to date, has put more than $30,000 into the development of the basic facilities of the project. It is anticipated that further investment by the County will be made. The Jackass Rock Camp is more thoroughly explained in other plans and publications of the Recreation Commission and should be referred to for details.

New Parks

An entirely new park is proposed in this plan to occupy several sections of land on Thornberry Mountain, between Teaford Saddle and Highway 41. The State Parkway would supply the public access to this park on the north side. The central branch of the Soquel Water Project canal would pass along the north edge of the park. The park itself will spread southward of the road and canal, over Thornberry Mountain and down the south slopes of it in an area otherwise generally unsuited for other uses. This land is currently under the control of the U.S. Forest Service and a transfer of control to a State of a County park would be required.

An entirely new park is also proposed at Little Table, just east of Highway 41, at the southeast corner of the Four Corners Small Area Plan. This area is proposed for either a State or County park and would include the mesas and tables of that unique geological feature, where rough land and rocky soil constituency preclude use or development for virtually any other conceivable land use. The area has unique characteristics as an interesting park serving this region of the Central Valley.

Wetlands

The Recreation Element of the Madera County General Plan includes a proposal for a Wetlands or Grassland Arboretum area in the far western region of the County, on the old sloughs and drainage ways of the San Joaquin and Fresno Rivers, north of Firebaugh. The area is not specified on the General Plan Map of the County; however, it is made a part of the Recreation Element of the General Plan in this text.

Neighborhood Parks

The small area general plans of the many communities in Madera County, in most cases, include proposals for small neighborhood parks in connjunction with multi-purpose buildings devised as neighborhood centers. These small parks are often shown in connunction with sewer plant sites in those small area plans. Those small neighborhood parks are a part of the overall Recreation Element of the General Plan of Madera County.

A school is a principal center in a small community. Land adjoining a school should be developed into compatible uses. Parks, playgrounds, neighborhood centers, and similar recreationally-oriented functions can very well be established on land adjoining school sites.

Scenic Drives

The Recreational aspects of scenic drives are also included in this Recreation Element of the General Plan. Three major scenic drives are proposed and these have been expressed in the Land Use Element, as well as in the Transportation and Circulation Element of this General Plan. One of these scenic drives would utilize the existing Raymond-Ahwahnee Road. The second would use the River Road and the Bates Station Road through the center of the County, and the third, in the southern portion of the central area of Madera County would make use of the old road system from the vicinity of Four Corners small area, through Belleview, the Hildreth region, the O'Neals area, and back to Friant, below Millerton Dam. These scenic drives are expressed as a direct contributing part of the Recreation Element of the General Plan of Madera County. Coordination of that recreational drive function with the other traffic functions of these existing roadways is recognized.

Multiple Use

Continued expansion of the multiple-use concept of lands in Madera County's agricultural and forestry areas is recommended in this General Plan. The Plan proposes that private land owners be encouraged to develop privately sponsored and privately controlled recreational activities on open lands otherwise used for agricultural plantings or grazing and forestry uses. Such multiple use of these lands may well be the key to overcoming the increasing impact of rising land taxes as applied to the existing agricultural or forestry uses of the land.

Boat Launching Sites

The construction of new boat launching facilities on several lakes in Madera County has been expressed in the proposals of the Recreation Commission and is reiterated here. Boat launching facilities on each major body of water of Madera County is recommended as a part of the Recreation Element. The opening of some sloughs and by-ways in the far western region of the County for use by canoeists is also a planned part of this Recreation Element.

Airports

It is recognized that the generation of several new airports as expressed in the Transportation and Circulation Element of the General Plan will have a direct positive effect upon the expansion of sports aviation in Madera County as a part of the recreational development. Of particular importance are the several new airports proposed in the foothill and mountain areas of the County where they can serve as focal points for other recreational activities by persons arriving by air. Of particular significance to the economy of Madera County as well as to the recreational segment of this function is the Allen Ridge Airport, planned just above the Oakhurst and Yosemite Forks Small Area General Plan regions. A detailed study of

the benefits of such an airport has been provided by the Economic Development Administration as background for planning and engineering of that facility.* The Allen Ridge Airport above Oakhurst and Yosemite Forks is planned to become an air transportation focal point for persons entering and leaving Yosemite Park and many recreational areas in Madera's eastern mountainous area. The airport would incidentally serve a direct economic function, providing regular passenger air service to and from the rapidly developing mountain region.

Some new, diversified industry might be attracted by this air facility. The recreation industry of Madera County, however, would appear to be the principal recipient of benefits from the development of that airport.

The development of a new airport adjoining Millerton Lake State Park is expected to contribute significantly to the use of that park by the persons arriving by air. New airports are proposed at Beasore Meadow and just above Mammoth Pool Dam. Continued use and some expansion and hardening of the surface of the Arnold Meadow Airstrip is also planned in this element. Another airport is proposed at Jackass Meadow. These latter four airports would be principally developed for utilization by recreation-oriented travellers.

Shooting Ranges

The Recreation Element of the Madera County General Plan specifically proposes the development of several safe, controlled shooting ranges in certain open areas of Madera County. These are not shown on the General Plan Map of the County, but they are planned to be constructed in some open areas of Madera County when specific sites can be acquired.

Minarets Summit Highway

The continued development of the Minarets Summit Highway to the east of its present terminus just above Jackass Rock Camp is proposed as a part of this General Plan and is reiterated here in the Recreation Element because of its high impact on the recreational uses of land in the mountain region of Madera County. This highway would provide direct access to many currently inaccessible areas of the County and thus enhance the recreational use of some of the land immediately adjoining the new highway.

*Schelin Associates, Twain Harte, Calif., "Economic and Planning Feasibility Study for a General Aviation Airport..., Madera County, California."

Search and Rescue Aircraft

Reference is made herein to the increasing use of the mountainous areas of Madera County in the wintertime. Increasing accessibility by means of snow vehicles has increased the need for aircraft planned to be provided for the Madera County Sheriff's Department elsewhere in the Transportation and Circulation Element of this General Plan.

Provision of these vehicles for search and rescue purposes in these winter sports areas would be a significant contributing factor to the expansion of winter recreation in the mountain region of Madera County. Formerly recreational use was at a low ebb during this time of the year. The diversification, as well as increase in total recreational use in this area, will have increasing economic value to mountain merchants.

Historic Sites

The Madera County General Plan Map has displayed on its surface a number of symbols prefaced with an H. Each of these H number designations represents an historical site. Following is a list of historical sites according to those numbers shown on the General Plan Map of Madera County.

1. Gravelly Ford
2. Skaggs Bridge
3. La Vina
4. Monte Redondo
5. Chowchilla
6. Califa
7. Berenda
8. Madera Post Office
9. Borden
10. Irrigosa
11. Riverview
12. Kismet
13. Storey
14. Lankershim
15. Patterson
16. Southern Pacific Railroad Berenda-Raymond Spur
17. Center of the State
18. Buchanan Mine
19. Savage Monument
20. Bates Post Office
21. Jones Ferry
22. Hamptonville (Pollasky)
23. Indian Village
24. Wildcat Station (Raymond)
25. Knowles
26. Bates Station
27. Zebra Mine
28. Fort Miller
29. Kelshaw Corners
30. O'Neals
31. Miami Post Office
32. San Joaquin and Henrietta Mine
33. Summit House

34. Picayune Indian Settlement
35. Marbo Post Office
36. Grubb Gulch
37. Texas Flat Mine
38. Waterloo Mine
39. Canary House
40. Topps Mine
41. Fine Gold Post Office
42. Nipinnawassee
43. Fresno Flats Post Office
44. Bass Lake Post Office
45. Wishon Post Office
46. North Fork Indian Mission
47. Cascadel
48. Yosemite Park
49. Madera Flume and Trading Co. Flume
50. Minarets Post Office
51. Hogue Ranch
52. Raymond Mountain Mine
53. Strawberry Tungsten Mine

This Recreation Element of the General Plan of Madera County plans to preserve and make accessible all of these historic sites in conjunction with the County Historical Society and private doners, as well as State and National organizations.

San Joaquin River Gorge Park

An entirely new, large park is proposed along the San Joaquin River Gorge on the south and east sides of the Minarets Summit Highway. This is one of the most magnificent view areas in the entire Sierra Nevada. This gorge rivals in scenic values and in unspoiled nature the Yosemite Valley itself. The principal difference is that this gorge does not have the broad, flat valley floor that Yosemite does and, as a consequence, is not nearly as accessible. The possibility of access by special vehicle and by cable car, as well as by hiking and riding trails, increase the viability of this plan.

Much of the area shown on the General Plan map within the confines of the San Joaquin River Gorge Park is not particularly suited to sustained yield forestry. In the gorge itself, and on the slopes of the mountains surrounding it, extreme slopes and rock outcrops, with very few large expanses of soils suitable for tree growing, reduce the possibility of direct use as sustained yield forestry area. There are, however, numerous areas of trees which could allow the land to be continued in forestry use; however, being a part of the open area of the park itself. This plan for the San Joaquin River Gorge Park is made a part of the Recreation Element of the General Plan of Madera County.

Wayside Parks

In conjunction with the Transportation and Circulation Element, this Recreation Element expresses the need for highway wayside parks in two particular areas of Madera County - along Highway 99 and along Highway 152. In addition, when California 65 Freeway is constructed and Highway 152 is extended to the east, wayside parks should be established at significant points along those two new major highways. At this time, highway wayside parks are proposed along the southern five or six miles of Highway 99 in Madera County and at the far western end of Highway 152, near the Red Top area in Madera County.

Fresno River Strip Park

The City of Madera and the County of Madera jointly propose the utilization for recreation of the floodplain of the Fresno River through the Madera Megropolitan area and upstream to Lake Madera and on upstream to the equalization lake as a strip park along the floodplain of the Fresno River. This can be developed in conjunction with the proposed construction of the new Hidden Dam and Hidden Lake on the Fresno River which will significantly control flood waters downstream. Some places on the bank above the floodplain are also planned for particular recreational purposes. The floodplain itself is proposed for principally open space recreational uses, whereas several points along the bank are proposed for structural facilities associated with recreational uses. The strip park will provide hiking and riding trails as well as several picnic and small swimming areas along the strip, extending from the Madera Fairgrounds on the downstream end to the Madera Canal and Equalization Lake on the upstream end, on the alighment of the Fresno River floodplain. This is a joint recommendation and a joint plan by the City and the County.

Berenda and Ash Creek parks

In the Chowchilla region, floodplain strip parks are proposed along Berenda Creek on the south and Ash Creek on the north. These proposals are contained in the General Plan for the County as a whole and in the small area general plans for the region surrounding Chowchilla. Other strip parks along floodplains are considered feasible in this recreation Element of the General Plan of Madera County.

Town Park

A recreational town park is proposed in the downtown County Park in the City of Madera. It is recommended that it be called Hughes Park. This Recreation Element plans for the development of a swimming pool for teenagers, a dance pavillion, and possibly a tea house or a coffee house in a pleasant style of architecture, designed to generate more public use of that park. An immediate tree planting program is recommended in this park, since many of the trees are reaching maturity and many will have to be simultaneously removed. A tree planting program init-

iated at this time would help to prevent a serious decimation of the tree population in the park at the time when those mature trees are removed.

Museum of Farming and Ranching

A farm and ranch museum, exhibiting historical artifacts of farming and ranching in the valley is planned for a site near the City of Chowchilla. It is proposed to be developed by a non-profit corporation on a site directly accessible from Highway 152 and Highway 99. The General Plan Map of the County does not show a specific site for the ranch museum but this text does recommend the location of that farm and ranch museum near existing eating and lodging facilities.

Museum of Mining

The development of two old mining areas as accessible historical sites is planned. The development of the Texas Flat Mine in a small public park area is recommended at the site of the Texas Flat Mine, just north of Coarsegold. Another combined mine display and historic site park is proposed at the Gambetta Mine along both sides of the Raymond-Ahwahnee Road in the vicinity of Grub Gulch. Combined public and private development of these historic sites and parks is recommended.

Historical Museum

A historical museum is planned to be developed in the old Madera County Court House in conjunction with the Historical Society of Madera County. Some State funds may be available to aid this.

The Recreation Element proposes that the old Court House and clock tower on Yosemite Avenue be used as a County museum. This recommendation is referenced for reiteration in the County Capital Budget Element of the General Plan.

River Filling

Because of interference with the appearance of this County, as well as interference with the use of several floodplains for strip parks or parkways, this Recreation Element strongly recommends stringent enforcement of the laws prohibiting illegal filling of river and stream floodplains. The use of these river banks and floodplains for dumps and disposal of garbage, trash, automobiles, and other materials significantly impairs the appearance of the County and reduces the utility of these areas for recreational purposes now and in the future.

Watershed Projects

The Drainage Element of the General Plan of Madera County will include proposals for some small watershed projects. The development of these small watershed projects can almost always be coordinated with the development of small local recreational functions. It is recommended in this General Plan that small watershed projects be encouraged among ranchers and land owners in the foothill and valley portions of Madera County in conjunction with the multiple use concept, including recreation as a use of the land.

Recreation Potential

As background information to this element of the General Plan of Madera County, the Recreational Potential Study by the Technical Action Panel (TAP), sponsored by the Soil Conservation Service of the U.S. Department of Agriculture, (specifically accomplished by the local office of the Soil Conservation Service), should be reviewed as background information concerning the potential for recreational development in Madera County. Specific evaluations of the development of recreation in Madera County are expressed in that study and report.

Archaeological Sites

An important aspect of the Recreational development in Madera County in the future will be the development of certain archaeological sites and facilities. Included in this Recreation Element is an Archaeological Element of the General Plan of Madera County. This Archaeological Element was prepared by the Committee on Sierra Foothill Public Archaeology of the Society for California Archaeology. State laws and sample ordinances relating to the Archaeological section are shown, along with other similar materials, in the Appendix to the next section. The following Archaeological Section of the Recreation Element of the Madera County General Plan is one of the few so specifically expressed in county plans in the State of California, or elsewhere in the United States. It is a very important part of the Recreational Element of this General Plan.

Town and Country Park

A comprehensive 50 acre regional park should be established on lands adjoining and on the existing city sewer farm in conjunction with the removal of the sewer plant to a new site. This land is currently owned by the City of Madera and has had some initial recreational facilities constructed on it.

The State Department of Parks and Recreation has available funds for the development of basic facilities in such a park.

It is recommended that this park be designed to serve the recreational needs of a large region and all age groups. An existing canal on the premises should be diverted to create ponds and waterways in the park.

Detailed plans of development of this park are available from the City of Madera. Coordination of this park with the City of Madera is recommended.

Appearance/Recreation

A prime basis of land value in Madera County is appearance and natural surroundings. This is particularly true in the mountain region where the principal reason for acquiring land and living there is appearance and natural surroundings. This appearance factor has a profound effect on the attractiveness of the County to recreation seekers.

Therefore, significant efforts to preserve and enhance these appearance factors are critical modes of action to be considered in the future. Failure to be concerned about the appearance of Madera County, (in the mountain region especially), will otherwise have far-reaching negative effects upon the growth of Madera County.

ARCHAEOLOGICAL ELEMENT

Introduction

Archaeologically important areas can be found in Madera County. These archaeological areas constitute an important natural resource and source of recreational enjoyment, as well as academic endeavor on the part of many people today. A growing interest in the study of archaeological finds can be seen as a trend in California and our country today. Thus a specific element of our General Plan related to our Natural Resources and Recreational Elements is an Archaeological Element.

The following Archaeological Element was prepared by the Committee on Sierra Foothill Public Archaeology of the Society for California Archaeology in October of 1968. This work was done specifically at the request of the Madera County Planning Department under the direction of the Chairman of the Society for California Archaeology, Mr. Thomas King, Chief Archaeologist, Archaeological Survey, University of California, Los Angeles.

Archaeology in Madera County.

In spite of its central location, Madera County has seen little of the archaeological investigation that has focused on other parts of California. In the Sacramento Delta region, Man's cultures have been traced back over 5,000 years, through three general cultural periods representing intrusions of new people and successive new adaptations to a changing environment and technology. On the Southern California coast different peoples, different problems of environmental adaptation, led to varying cultural expressions in the better than 7,000 years of known prehistory. In the Great Basin, with the shrinking of the giant Ice Age lakes, human social groups adapted with precision to the gradually evolving desert environment. Many of the peoples of the Great Basin utilized the High Sierra as well, where they met and established relations with central California groups. This area, however - the Sierra, its foothills, and much of the Great Central Valley - remains underinvestigated by archaeologists, whose limited funds and manpower have been expended elsewhere, especially in rapidly urbanizing areas where archaeological sites are in daily danger of destruction and must be "salvaged".

Ironically enough, there are evidences of very early occupation in the vicinity of Madera County. The Farmington Complex, an archaeological model based on a crude pebble-tool assemblage found in the streambeds of the Sierra foothills, is thought by some to date from the late Ice Age, and at the controversial Tranquility Site in western Fresno County, human bones were indicated by flourine content to be the same age as those of extinct camels.

Archaeologists, however, are concerned with much more than age. Archaeology in America is a subdivision of Anthropology, the study of Man's societies, their histories, and variations. Since the varied and accomplished cultures of aboriginal California are virtually lost to us as living units, only archaeology can provide the key to their natures and origins.

In the last few years, salvage archaeological projects sponsored by the National Park Service have begun to provide basic data on Madera County prehistory. The Buchanan Archaeological Project, administered by the San Francisco State College Archaeological Survey, will complete its work in 1969 behind the proposed Buchanan Dam on the Chowchilla River. Important cemeteries, ceremonial and dwelling structures, upland

camps and riverside villages have been explored, yielding information on perhaps 3,000 years of successive occupations. On the Fresno River, behind the proposed Hidden Dam, preliminary work by California State College, Long Beach has revealed significant similarities to and differences from the Buchanan sites a few miles away.

Virtually all parts of Madera County are rich in prehistoric sites, all that remains of the historic Indians, the Miwok and Yokuts, and their predecessors. Every site is important in the reconstruction of the County's past and in understanding the ways of Mankind in general. Failure to consider the presence of archaeological sites in development planning, failure to recognize their importance and failure to provide for scientific excavation before their destruction by the forces of change have resulted in irreparable damage.

Site Types and Means of Destruction

The County's varied topography is matched by - and partly responsible for - its variety of archaeological sites.

1. Valley Sites: The San Joaquin Valley was the country of the Yokuts linguistic group, who held a common language though divided into a large number of autonomous tribes. Earlier people, Yokuts-speakers or others, lived in the Valley for thousands of years before, and many Yokuts villages were perched atop high mounds representing thousands of years of accumulated debris. Such mounds are rich in burials, structural remains and artifacts, and are often stratified with observable or deducible layers representing different time periods.

The Valley sites have suffered great destruction at the hands of agriculturists seeking level farmland; characteristically they have been bulldozed down and used to fill in low spots. In some cases, literally thousands of artifacts have fallen into the hands of local collectors or, in some cases, museums, but without data on location or association with burials, houses, or other features, and thus with little value for prehistoric research.

2. Foothill Sites: In the foothills north of the Fresno River lived the Miwok, with language and customs divergent from those of the Yokuts. South of the Fresno were the Chuckchansi, a foothill dialect of the Yokuts. In the Miwok area, at least, where the Buchanan Project has provided us with a sample of typical sites, the characteristic settlement pattern appears to involve large, widespread villages with communal dancehouses, surrounded by poorer satellite villages, and camps for specific hunting and gathering activities in favored spots. The sites vary a good deal on the basis of the sort of ecological niche that they filled, and large stratified villages show a great deal of change through time.

Thus far, the foothill sites have been primarily damaged only by the attentions of misdirected persons seeking "Indian relics" as curios. Not realizing that context - the position and surroundings of an artifact - is at least as important as the artifact itself in yielding information on Indian history and lifeway, and untrained in the techniques for preserving, observing, and recording context, such collectors have destroyed or damaged many foothill sites. Roads and residential construction have taken others, and the tempo of this destruction will no doubt increase as foothill grazing lands become increasingly urbanized.

3. Mountain Sites: At higher elevations, the Miwok and Chuckchansi spent their summers hunting and gathering pine nuts and other available foods, away from the heat of the foothills. Here they mingled with Mono and Paiute from the east slope of the Sierra, and traded with them for obsidian from Owens Valley. Mountain sites are for the most part rather small, but tend to be rich in hunting paraphenalia. This makes them an open target for relic-hunters seeking "arrowheads", and many mountain sites have been badly pillaged. Resort, cabin, and summer-home construction, facing on streams and meadows that attracted the Indians as well, have also taken their toll, and many sites have been destroyed by bulldozing and clearing operations in connection with the logging industry.

The mountains are also the locale in which most petroglyphs and pictographs - carvings and paintings on rocks - are found. Such rock art is often found along game trails, and may, in some instances, have served as a magical source of luck in hunting. Very elaborate petroglyphs and pictographs occur south of the Fresno, where they may have been involved in the "psychedelic" toloache or jimsonweed cult practiced by the Yokuts. Petroglyph and pictograph sites are also found in the path of modern construction, and may be destroyed without a tract. They are also often the targets of vandals with hammers, guns, or spray-cans, who delight in adding their own "special touch" to the ancient art forms.

The County in Archaeology

Archaeological sites are valuable assets to a community. Like open spaces, uncut forests, unpolluted streams, they are a contact for the public with an aspect of the natural world, as well as being a window into another culture. For many of this Country's citizens - its first citizens - archaeological sites are vestiges of a very real and personal past - the past heritage of their own race. To learn from the controlled excavation and study of archaeological remains, and to participate in such research under supervision through school and other programs, is a source of great enlightenment and enjoyment for thousands of Americans. In addition,

and most basic, the study of archaeological sites by trained scholars increases our body of knowledge about Man and his ways, and enlarges the hope that one day, to our great benefit, we will knowoutselves better.

Many public agencies and private organizations have recognized a responsibility to provide for archaeological salvage when sites are endangered by modern construction, and to discourage vandalism and other unwarranted destruction.

The Federal Antiquities Act, (P.L. 209, 1906; See Appendix I), protects archaeological sites and materials on Federal lands, and provides for permits for the gathering of material and data for study by reputable institutions. Most Federal agencies, working through the National Park Service and the Smithsonian Institution, provide for archaeological salvage excavation by colleges and other scholarly institutions when their programs endanger archaeological sites.

The California State Penal Code, (Sec. 622.5; See Appendix I), punishes as a misdemeanor the destruction of any archaeological object or site by any person not the owner thereof. The California Public Resources Code, (Section 5097.5), forbids the unauthorized destruction of archadological sites on all public lands, public lands being defined as "lands owned by, or under the jurisdiction of, the State, or any city, county, district, authority, or public corporation, or any agency thereof". Both the California Highway Department and the Department of Parks and Recreation provide for salvage research when their construction programs endanger archaeological lites.

The County of Marin, under Ordinance 1589, (See Appendix II), forbids the destruction of archaeological sites on all lands, public and private, within the county without prior investigation and, as appropriate, excavation by trained archaeologists.

The County of Inyo, under Ordinance 146, forbids the disturbance of any archaeological site without first obtaining a permit from a special board and indicating that the disturbance is scientifically justifiable. (See Appendix II).

Many private corporations have also recognized their responsibility for preserving and salvaging archaeological values; Pacific Gas and Electric Company routinely contracts for archaeological salvage when their projects endanger archaeological values. Extensive archaeological salvage was funded in a housing tract in Contra Costa County by the Rossmore Corporation; and important cemetery was saved and excavated with funds from Lytton Finance in a housing tract in Marin County, and the Fremont Meadow Corporation recently made funds available for salvage excavation in Alameda County where a site will be destroyed by a shopping center. Pacific Telephone and Telegraph is cooperating with archaeologists to salvage data endangered by their constructions in the San Francisco Bay Area; the Marblehead Land Company in Los Angeles County has made salvage possible on an important early site endangered by a trailer court, and the Irvine Ranch in Orange County cooperates in the salvage of both prehistoric and historic sites that lie on their properties in the path of destruction. These companies have generally been very satisfied with the public relations advantages and free publicity that their activities receive by enabling archaeologists to salvage endangered sites.

But the responsibility to preserve and salvage sites is only one side of the coin; the other is the development of archaeological sites and materials for public enjoyment and enlightenment. As in salvage work, the federal government is in the fore with this kind of operation; National archaeological parks and monuments such as Mesa Verde are well known. The State of California has long preserved historic sites and maintained an Indian Museum in Sacramento, and has recently begun a program of interpretive excavations and preservation at archaeological sites within state parks. A good local example is at the new State recreation area on the San Luis Dam forebay, where Indian dwellings have been excavated and eventually will be preserved and developed for public display. At San Luis too, a very attractive and meaningful display of materials and data excavated behind the dam by a long-term archaeological salvage project has been prepared in the visitors' center.

In the San Francisco Bay Region, the East Bay Regional Park District cooperates with local archaeologists in planning the development of a complex of large shellmounds, vestiges of large ancient villages, into an open-air museum facility. Today, undeveloped as yet but protected from vandalism by high fences, the sites and in-progress excavations by archaeology classes from Bay Area colleges are a popular attraction to park visitors.

The Marin County Planning Department also works closely with archaeologists in formulating park plans, and arrangements are now being made for archaeological elements in the park plans of several Southern California counties. The City of Los Angeles is in the process of developing a plan for interpretive excavations within its park system.

Another aspect to the utilization of archaeological sites is the involvement of the public in the process of archaeology itself. Across the State, amateur archaeological societies exist in many communities. While some such societies organize for nothing more than systematic collective vandalism, most are concerned with the scientific, systematic process of archaeology as a real means of learning about other cultures of the past. Such societies, usually with the advice and consent of scholarly institutions, conduct

salvage excavations and research, providing an important element of enjoyment and enlightenment to their members' leisure-time activities. Secondary schools, too, in which anthropology is increasingly becoming the focus for social-studies curricula, often provide their students with first-hand experience conducting systematic excavations in archaeological sites, and preparing reports of their work for publication. Especially exciting examples of this approach are to be found in the Catalina Laboratory for Archaeology at Avalon and the Novato High School archaeology program in Marin County. Junior colleges, too, conduct archaeological field classes, not only for "regular" students, but also through adult education programs, for persons seeking constructive leisure-time activities.

In summation, this committee proposes that County governments have a responsibility to protect archaeological materials and sites and an opportunity to develop such materials and sites for greater public enjoyment and education. On the following pages we propose certain specific programs for the discharge of this responsibility and the realization of this opportunity.

CONSULTING ARCHAEOLOGIST

To provide for continuing laison between county agencies and the archaeological profession, an unpaid Consulting Archaeologist should be recognized by the county. As there is at this time no college or junior college with a qualified archaeologist on its staff within the borders of Madera County, a Consulting Archaeologist could be suggested by the Society for California Archaeology, drawn from the number of archaeologists whose research brings them into frequent contact with Madera County region.

SALVAGE ARCHAEOLOGY

When plans are formulated for the construction of county roads, recreational facilities, or other facilities that involve disruption of the landscape, the county should notify the Consulting Archaeologist and provide him with appropriate maps, plans, and other data. The Consulting Archaeologist will then organize an archaeological reconnaisance of the region to be affected. On the basis of this reconnaisance, the Consulting Archaeologist will then submit a salvage research plan and budget to the county, to provide for excavation of an adequate sample of any site affected that is thought to be worthy of investigation. Such excavation, supervised by the Consulting Archaeologist or another qualified scholar, should utilize local personnel wherever possible, and should have as its goal the preparation of a final detailed report for publication, detailing the data recovered and its significance to the reconstruction of aboriginal culture, as well as preparation of materials and data for public-interpretive purposes where appropriate.

When permits are applied for by private agencies for construction or land leveling that will disrupt the natural landscape, the Consulting Archaeologist should be furnished with appropriate plans, maps, and other data so that an archaeological reconnaisance can be organized if necessary. On the basis of this reconnaisance, the Consulting Archaeologist will then provide to the county and the private agency concerned a report detailing the salvage excavations or other research that should be conducted before construction begins. The private agency should then be encouraged to allow, and if possible, sponsor this salvage research. It should be among the duties of the Consulting Archaeologist or his representative on such a project to insure that the agency sponsoring the project receives maximum public-relations benefit from its sponsorship.

INTERPRETIVE PROGRAM

This proposal recognizes the intention by the State Resources Agency or the U.S. Army Corps of Engineers to construct visitor-information facilities at the proposed buchanan and Hidden Dams. It also recognizes the desire by the Madera County Historical Society and other organizations and individuals to prepare and maintain a County Museum in the City of Madera, and the interest in several communities of the County to maintain local museums. It is suggested that the visitor-information facilities at the two dams include displays of archaeological materials and data from the excavations conducted behind the dams, prepared by trained museologists for maximum effect and properly protected from damage and theft. It is further suggested that an appropriate percentage of any County and/or local museumspace be devoted to the effective display of archaeological materials and data. Such displays could include materials and data from the Buchanan and Hidden Dam excavations, with the approval of the U.S. National Park Service and the responsible institutions, as well as materials and data from research conducted under County or private auspices.

This proposal also recognizes the recommendations made by surveying archaeologists at Millergon Lake State Park, i.e., that the sites recorded there be preserved and text-excavated, and endorses these recommendations. We would go farther, however, in urging that appropriate interpretive facilities be developed at Millerton Lake by the State Department of Parks and Recreation or another agency.

It is further recommended that an archaeological survey be made of the Bass Lake region and consideration be given to the possibility of interpretive excavations and facilities in connection with the public-use operations there.

While the U.S. Forest Service is cognizant of the need to protect archaeological sites and the value of developing them for public education, and has expressed willingness to cooperate with Madera County in archaeological programs, it has not been possible by this date to learn exactly what interpretive or other arcaheological plans may be in the making for Sierra National Forest. It is suggested, however, that the County remain aware of the plans of the Forest Service, and cooperate in the development of the archaeological resources within the National Forest.

It is further suggested that when junior colleges or other institutions of higher learning are established in Madera County, the trustees of such institutions be encouraged to give high priority to the employment of a qualified anthropological archaeologist, as a means toward expediting and coordinating the various educational and other archaeological programs that may be developed.

In general, it is recommended that as regional parks, scenic highways and roads, open space areas, and recreation facilities are planned and developed, provision be made for archaeological reconnaisance of the regions or projects involved, not only to warn of the possible need for salvage research, but also to formulate recommendations for the integration of archaeological interpretive elements, in the form of enclosed or open-air museums and educational facility sites, into the development of such projects and facilities.

COST FACTORS

It is usually possible to conduct archaeological surveys, of small regions at least, for little or no cost, especially if students or persons with avocational interests in archaeology are available locally. Large-scale investigations of large regions may be quite expensive; the total cost of surveys and excavations behind Buchanan Dam, for instance, is expected to run in excess of $50,000. Excavation of individual sites or small groups of sites, however, may cost only a few hundred or a few thousand dollars, or may be done virtually free, depending on the availability of college or other field classes, trained volunteers, and a number of other unpredictable factors. Development of interpretive facilities varies in cost dependent on the kinds of facilities contemplated, and publication of research data can be rather expensive, but costs can be cut through donation of printing by local publication houses, submission of acceptable manuscripts to professional journals, and other means. Accurate cost factors cannot be projected on a system not yet in operation, but archaeology need not be especially expensive to the County if all factors are intelligently coordinated

PUNITIVE MEASURES

It is not the purpose of this recommendation to suggest punitive measures to curtail vandalism and other kinds of archaeological site destruction, but such measures have proved useful in other counties.

CONCLUSION

Madera County has a rich prehistory stretching back several thousand years and enlivened by many aboriginal societies. The story of the County's past is only now beginning to unfold, thanks to "salvage" excavations behind Federal dams, but these investigations alone are not enough to tell the whole story, and many villages and campsites will be destroyed without benefit to science or the public if a sensitive program of site recognition, excavation, and development is not integrated into the formulation of a General Plan for the County's future growth.

SELECTED BIBLIOGRAPHY

1. Ethnography and Archaeology of Madera County

Barrett, S.A. and E.W. Gifford
1933 Miwok Material Culture, Public Museum of the City of Milwaukee, Bulletin 2

Bennyhoff, J.A.
1956 An appraisal of the Archaeological Resources of Yosemite National Park. University of California Archaeological Survey, Rept. No. 34. Berkeley

Latta, F.
1949 Handbook of Yokuts Indians. Bear State Books, Oildale

Moratto, M.J. and T.F. King
1968 Archaeology of the Buchanan Reservoir Region, Madera County, California, Parts I and II. San Francisco State College Occasional Paper No. 4

Theodoratus, D.J. and J. Crain
1962 Reconnaissance Survey of Millerton Lake State Park, MS on file with the State Archaeologist, Sacramento

Wallace, W.J.
1968 An Appraisal of the Archaeological Resources of the Hidden Reservoir, Madera County, California. MS on file with the National Park Service, San Francisco

2. Public-Interpretive Archaeology

Zahniser, J.L.
1968 A New Science for Secondary Schools. Publication of the Catalina Laboratory for Archaeology, Avalon

..... Report on the Excavation of
1967 Mrn-374. Publication of the Novato High School Archaeology Club, Novato.

APPENDIX I SUMMARY OF MAJOR FEDERAL AND STATE LAWS Pertaining to archaeological remains.

Courtesy University of California Archaeological Survey, Los Angeles.

Archaeological Survey

University of California, Los Angeles

FEDERAL Public Law No. 209, 1906

Jurisdiction over runis, archaeological sites, historic and prehistoric monuments and structures, objects of antiquity, historic landmarks and other objects of scientific or historic interest is given to the Departments of Agriculture, Interior and Defense on all lands under their supervision.

Permits for collecting, examining or excavating antiquities are granted by the Secretaries of the above Departments on lands under their respective jurisdiction. Permits are issued only to reputable museums, universities or other scientific institutions.

Any person authorized by the Secretaries of the respective Departments may apprehend violators of this law. Objects of antiquities, taken without permit can be seized by authorized persons.

Violators, upon conviction, may be fined not more than $500 or imprisoned for a period of not more than 90 days, or both.

Exception: Individuals may collect Indian artifacts found on the surface of the ground on National Forest lands without a permit.

CALIFORNIA
Section 622½, State Penal Code, (1039)

Every person, not the owner thereof, who willfully injures, disfigures, defaces, or destroys any object or things of archaeological or historical interest or value, whether situated on private lands or within any public park or place, is guilty of a misdemeanor.

A misdemeanor is punishable by imprisonment in the county jail for a period not to exceed six months, or a fine not to exceed $500, or both.

No information is given in this Section on how to obtain a permit or who may be deemed qualified to get a permit.

The pertinent portion of the 1956 Highway Act is as follows:

84th CONGRESS 2d SESSION

Report No. 2436

Federal-aid Highway and Highway Revenue Acts of 1956 Section 120 Archaeological and Paleonthological Salvage

Funds authorized by this title to be appropriated to the extent approved as necessary by the highway department of any State, may be used for archaeological and paleontological salvage in that State in compliance with the Act entitled "An Act for the preservation of American antiquities", approved June 8, 1906 (34 Stat. 225), and State laws where applicable.

HOUSING ELEMENT - EXISTING GENERAL PLAN

Certain parts of the Housing Element of the existing General Plan are reiterated here. These points directly relate to the specific plan proposals and action devices specified for the Open Space Element.

SPACE ALLOCATIONS

The allocation of land for housing in the County should follow these general principles of spacial allocations:

1. New housing should be directed as much as possible out of areas where high-valued agricultural soils and expensive water distribution systems for agricultural purposes exist.

2. Tract housing should be directed to relatively level land and on smaller but carefully designed lots.

More expensive, single family housing on larger lots should be directed into rolling and hilly lands not suitable for high-valued agricultural uses.

3. Mountain and vacation homes should be designed into areas generally in clusters to minimize physical environmental problems, increase efficiency in land use, and maintain some of the open space which is attractive to these buyers in the first place.

4. High density dwellings should be located near existing high volume traffic facilities and adjoining existing urbanized areas and commercial facilities. High density developments should also be provided with water and sewer systems.

5. Duplexes should be considered to be multiple family units and should be subjected to the same kind of coordination with traffic and utility facilities.

6. Hotels, motels, trailer parks, and mobile home parks should generally be located in areas similar to high-density residential developments for similar reasons.

7. Resort hotels and dude ranches should be protected by zoning and other regulatory means from encroachment by conflicting land uses.

8. Minimum one-acre lots should continue to be required for unsewered developments.

POSITIVE INDUCEMENTS

Positive inducements to encourage the use of sewer and water systems and cluster development should be utilized in regulations and development policies of the County.

One of these positive inducements to proper design and development is the so-called "Bulls-Eye Concept". Briefly, this concept allows developers, (in certain prescribed areas where such developments are positive contributors to the elements of this General Plan), to utilize certain public bonding methods for assistance in financing the public facilities necessary to the development of the new subdivision or business function. An in-depth discussion of this appears in the Implementation Section of this General Plan.

DEVELOPMENT STANDARDS

Development standards for new housing areas should include the following requirements:

1. Compliance with all existing codes, ordinances, and policies for development in Madera County.

2. A sewer and water system with adequate roads and drainage according to the proposed density and certainly, in all cases where average lots are less than one acre.

3. Cul-de-sacs and loop streets should be used wherever possible to minimize the amount of street service necessary and to isolate through traffic to the major arterials in the design area.

4. Adequate off-street parking should be required in all developments according to the requirements of the Madera County Zoning Ordinance.

5. Street tree planting should be required where adequate water is available for irrigation.

6. Street paving should be required in all residential subdivisions to avoid excessive maintenance costs in the future. Urban standard streets with curbs, gutters, and perhaps sidewalks should be required in certain highly-urbanized areas.

7. Street name signs and traffic control signs should be comprehensively applied in all new developments.

8. Fire hydrants should be included in order to provide protection according to the requirements of the State Fire Marshal.

9. Lot length should not exceed three times the average width.

10. Sites for public institutions such as schools, fire stations, police stations, and similar service functions should be provided in the new design and neighborhood centers and small neighborhood park areas should be made available in design areas anticipating more than 100 lots.

11. Adequate, functional drainage systems should be provided and coordinated with off-site drainage ways.

12. Access to adjoining properties should be provided to promote continued improvement of access to all developing lands.

In the mountain communities of Madera County there is a rising concept of the need to diminish regulation requirements and standards of development because of the recreational nature of these new developments. Experience has shown that relaxation of certain standards can be disastrous in view of the *increased physical hazards* involved in mountainside developments. Although certain standards for street width or building sizes or setbacks, or perhaps lot sizes should be adjusted to more adequately meet the recreational aspect of mountain developments, several other factors should perhaps be more stringently enforced to prevent physical disasters in the future. A principal factor to be observed in the development of mountain housing areas is the stability of the soil now and subsequent to development of the new housing area. Fortunately, Madera County has few existing areas of unstable soils or swelling and shrinkage. Prevalence of mobile masses of soil are not much in evidence and therefore not a major problem. It is important that these factors be very carefully verified each time a new development is proposed, however, in order to prevent the unhappy consequences of landslides.

The other principal problem in mountain areas that must be carefully worked out, whereas it is not so much a problem in the valley area, is that related to the drainage of waters on steep slopes. The surfacing of large areas with hard materials and the grading of pads for building sites, parking areas, roads, etc. can significantly change the amount of drain water flowing over certain portions of mountain area developments. This Housing Element of the General Plan, therefore, recommends that especial care be exercised in the development of local drainage facilities in mountain housing developments.

NEW APPROACHES

New approaches to housing should be encouraged and flexible regulations and policies should be established to allow certain experimentation within the basic requirements of overall density and provision of basic facilities in new developments. For example, some of the new concepts that might be applied include:

1. Cluster developments, sometimes with extremely small lots used for building sites and open space provided elsewhere in the development area to maintain a reasonable *average* density for the overall development.

2. Entirely new communities. Some of these might be developed essentially over existing old urbanized areas or small community areas in Madera County.

3. New housing developments centered on *developed* recreation features such as golf courses and the new lakes and parks being constructed in this County.

4. The use of deed restrictions and other mechanisms applied in new developments to encourage coordinated architectural and landscape features.

5. The use of new building materials not specified in the local building code but of equal performance capability. This should be allowed to be used wherever adequate evidence of the suitability can be provided.

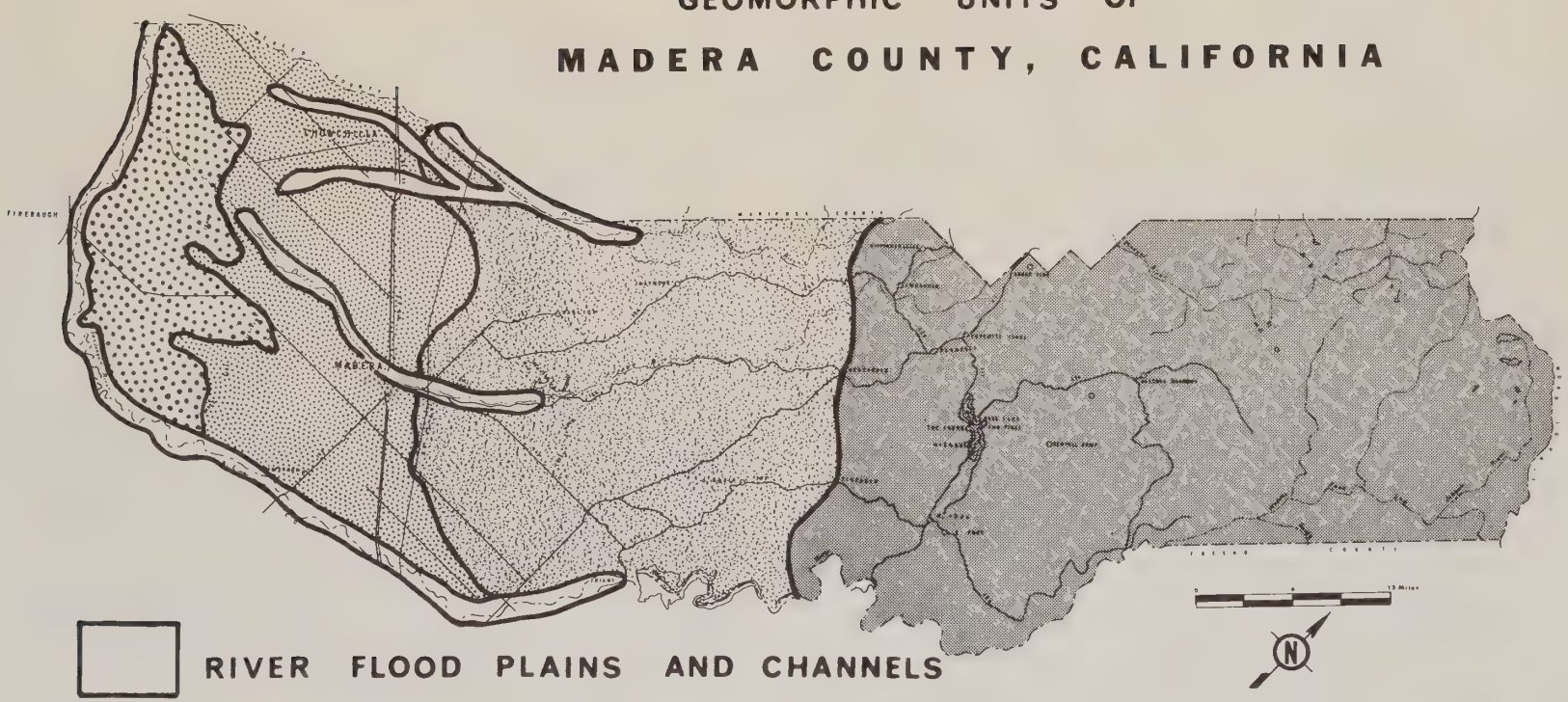
6. The entire gamut of Federal and State housing and community improvement programs. These should be explored and applied wherever possible in the attack upon the rejuvenation of housing and environmental quality in Madera County.

COORDINATION

It is also recommended in this Housing Element of the General Plan that the development of new housing areas in the County be carefully coordinated and related to the development of the transportation facilities, the public facilities such as schools, sewer and water systems, and with careful appreciation for the conservation of the natural resources, the visual appearance, and the quality of air, water, and land.

APPENDIX

GEOMORPHIC UNITS OF
MADERA COUNTY, CALIFORNIA



RIVER FLOOD PLAINS AND CHANNELS

BASIN OVERFLOW LANDS

LOW ALLUVIAL PLAINS AND FANS

DISSECTED UPLANDS

MOUNTAINS

SOURCE– UNITED STATES GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1469

MAP 3

LEGEND

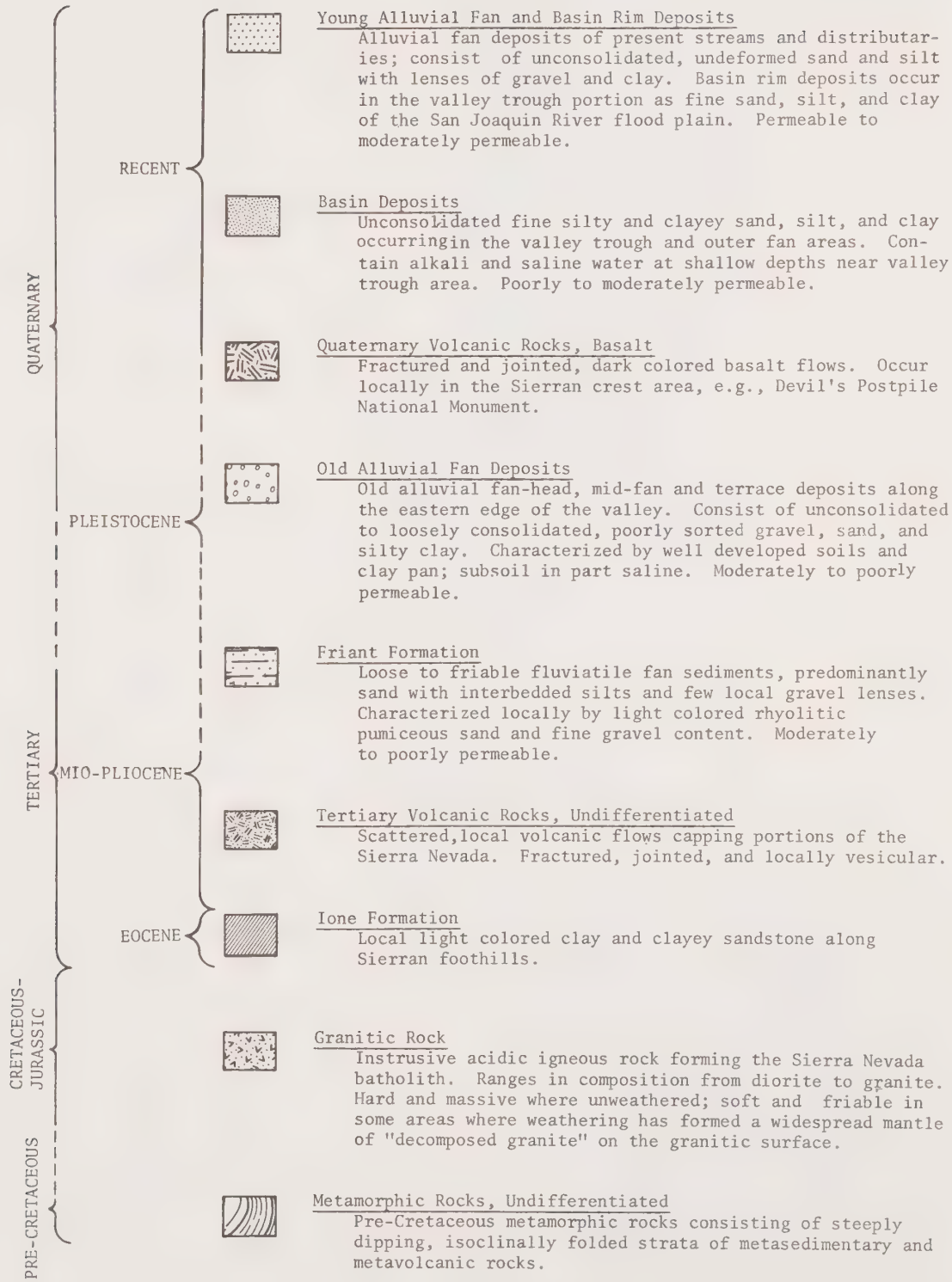

QUATERNARY
TERTIARY
CRETACEOUS-JURASSIC
PRE-CRETACEOUS
RECENT
PLEISTOCENE
MIO-PLIOCENE
EOCENE
Young Alluvial Fan and Basin Rim Deposits
Alluvial fan deposits of present streams and distributaries; consist of unconsolidated, undeformed sand and silt with lenses of gravel and clay. Basin rim deposits occur in the valley trough portion as fine sand, silt, and clay of the San Joaquin River flood plain. Permeable to moderately permeable.
Basin Deposits
Unconsolidated fine silty and clayey sand, silt, and clay occurringin the valley trough and outer fan areas. Contain alkali and saline water at shallow depths near valley trough area. Poorly to moderately permeable.
Quaternary Volcanic Rocks, Basalt
Fractured and jointed, dark colored basalt flows. Occur locally in the Sierran crest area, e.g., Devil's Postpile National Monument.
Old Alluvial Fan Deposits
Old alluvial fan-head, mid-fan and terrace deposits along the eastern edge of the valley. Consist of unconsolidated to loosely consolidated, poorly sorted gravel, sand, and silty clay. Characterized by well developed soils and clay pan; subsoil in part saline. Moderately to poorly permeable.
Friant Formation
Loose to friable fluviatile fan sediments, predominantly sand with interbedded silts and few local gravel lenses. Characterized locally by light colored rhyolitic pumiceous sand and fine gravel content. Moderately to poorly permeable.
Tertiary Volcanic Rocks, Undifferentiated
Scattered,local volcanic flows capping portions of the Sierra Nevada. Fractured, jointed, and locally vesicular.
Ione Formation
Local light colored clay and clayey sandstone along Sierran foothills.
Granitic Rock
Instrusive acidic igneous rock forming the Sierra Nevada batholith. Ranges in composition from diorite to granite. Hard and massive where unweathered; soft and friable in some areas where weathering has formed a widespread mantle of "decomposed granite" on the granitic surface.
Metamorphic Rocks, Undifferentiated
Pre-Cretaceous metamorphic rocks consisting of steeply dipping, isoclinally folded strata of metasedimentary and metavolcanic rocks.

TABLE 1

TABLE OF GEOLOGICAL HISTORY

ERA	PERIOD	EPOCH	Absolute age in years before present	Major geologic events in United States given in order of increasing age	Distinctive features of plant and animal life	
CENOZOIC	QUATERNARY	Recent		Minor changes in land forms by work of streams, waves, wind	Rise of civilizations	Age of Man
		PLEISTOCENE	10,000	Four stages of spread of continental ice sheets and mountain glaciers	Development of man; extinction of large mammals	
	TERTIARY	PLIOCENE	1,000,000	Cascadian orogeny: Cascade and Sierra Nevada ranges uplifted; volcanoes built	Early evolution of man; dominance of elephants, horses, and large carnivores	Age of Mammals
		MIOCENE	12,000,000	Marine sediments deposited on Atlantic and Gulf coastal plain; stream deposits spread over Great Plains and Rocky Mountain basins; thick marine sediments deposited in Pacific coastal region	Development of whales, bats, monkeys	
		OLIGOCENE	25,000,000		Rise of anthropoids	
		EOCENE	35,000,000		Development of primitive mammals; rise of grasses, cereals, fruits	
		PALEOCENE	60,000,000		Earliest horses	
MESOZOIC	CRETACEOUS		70,000,000	Laramide orogeny: Rocky Mountains formed	Extinction of dinosaurs; development of flowering plants	Age of Reptiles
				Marine sediment deposition over Atlantic and Gulf coastal plain and in geosyncline of Rocky Mountain region		
	JURASSIC		130,000,000	Nevadian orogeny: Intrusion of batholith of Sierra Nevada region	Culmination of dinosaurs; first birds appear	
				Marine sediment deposition in seas of western United States; desert sands deposited in Colorado Plateau		
	TRIASSIC		165,000,000	Palisadian disturbance: Block faulting in eastern United States	First dinosaurs; first primitive mammals; spread of cycads and conifers	
				Deposition of red beds in fault basins of eastern United States and in shallow basins of western United States		
PALEOZOIC	PERMIAN		200,000,000	Appalachian orogeny: Folding of Paleozoic strata of Appalachian geosyncline	Conifers abundant; reptiles developed; spread of insects and amphibians; trilobites become extinct.	Age of Amphibians
				Deposition of red shales and limestones in southwestern United States; much salt and gypsum (glaciation of southern hemisphere continents)		
	CARBONIFEROUS: PENNSYLVANIAN		235,000,000	Deposition of coal-bearing strata in eastern and central United States	Widespread forests of coal-forming spore-bearing plants; first reptiles; abundant insects	
	CARBONIFEROUS: MISSISSIPPIAN		260,000,000	Deposition of limy, shaly sediments in widespread, shallow seas of central and eastern United States	Spread of sharks; culmination of crinoids	
	DEVONIAN		285,000,000	Acadian orogeny: Folding and igneous rock intrusion in New England	First amphibians; many corals; earliest forests spread over lands	Age of Fishes
	SILURIAN		325,000,000	Deposition of thick marine strata in geosynclines of eastern and western United States	First land plants and air-breathing animals; development of fishes	
	ORDOVICIAN		350,000,000	Taconian orogeny: Folding of rocks in eastern United States, Nevada, and Utah	Life only in seas; spread of molluscs; culmination of trilobites	Age of Marine Invertebrates
	CAMBRIAN		410,000,000	Deposition of thick marine strata in geosynclines of eastern and western United States	Trilobites predominant; many marine invertebrates	
			500,000,000			
	Pre-Cambrian time; age goes back to nearly three billion years			Many periods of sediment deposition alternating with orogeny	Earliest known forms of life; few fossils known	

Source: Strahler, Arthur, N., Physical Geography. New York: John Wiley & Sons, Inc. Second Edition, 1960, p. 293. Reprinted by permission of John Wiley & Sons, Inc.

TABLE 2

Geologic history of the San Joaquin Valley and bordering mountains

Epoch	Coast Ranges	San Joaquin Valley	Sierra Nevada
Late Cretaceous	Shallow-water marine sediments several thousand feet thick deposited in sinking geosyncline.	Deposition of clastic sediments in shallow sea occupying the northern and western parts of present valley. Downwarping keeps pace with deposition.	Erosion uncovers granitic rock over broad areas. Rocks of early Mesozoic and Paleozoic age folded in low parallel northwest-trending ranges and intruded by igneous rocks of granitic composition (Nevadan revolution).
Paleocene	Deposition of marine sediments in restricted troughs; sedimentation practically uninterrupted along east flank of present Coast Ranges.	Sea retreats westward but marine deposition is continuous in northwestern part of valley.	Erosion continues; western part of range presumably well to west of present Sierra Nevada.
Eocene	Marine deposition along east flank and at north end of Diablo Range. Upwarping in early Eocene raises much of area above sea level.	Shallow sea occupies most of valley area, shore locally encroaches on Sierra Nevada and Coast Ranges. Streams from Sierra Nevada deposit nonmarine clay and quartzose sand along eastern border of valley.	Earliest volcanic activity (andesitic and rhyolitic rocks extruded). Moderate uplift or change in base level causes dissection of weathered rocks. Tropical climate and gentle slopes result in deep weathering of rocks in place on western slope.
Oligocene	Most of ranges above sea level. Marine deposition in narrow basin along east flank.	Volcanic sediments of rhyolitic composition are deposited in northeastern part of valley; nonvolcanic continental deposition in southeastern part. Marine deposition along western margin and at south end of valley.	Eruptions of volcanic material, including much rhyolitic ash, continues. Erosional debris locally dams and diverts streams.
Miocene	General trend of present structural and topographic features is established Volcanic activity is recorded by deposition of local ash beds. Most of the area is submerged in middle and late Miocene, great thickness of marine sediments deposited along east flank of Coast Ranges including abundant organic siliceous shales. Subaerial erosion in most of area during early Miocene.	Deposition of nonmarine volcanic sediments in northeastern part of valley and nonvolcanic continental sediments in southeastern part of valley contemporaneous with marine sedimentation in western and southwestern area. Organic siliceous shale abundant in marine deposits. Valley largely above sea level during early Miocene.	Uplift along faults on eastern border elevates range several thousand feet. Mudflows of andesitic detritus originating near crest of range cover most of western slope opposite northern San Joaquin Valley, thereby disrupting older drainage. Volcanic eruptions widespread north of Tuolumne River, local eruptions to south.
Pliocene	Folding and faulting on regional scale in late Pliocene outlines present form of ranges. Northern part of central Coast Ranges undergoing subaerial erosion, concurrently with deposition of marine sediments in local basins in southern part of ranges during early and middle Pliocene.	Extensive lake occupies western part of valley for a time in late Pliocene. All the valley above sea level in late Pliocene. Great thicknesses of continental deposits accumulating in downwarping basins along western and southern margins of valley. Streams from Sierra Nevada depositing generally fine-grained alluvium on east side, includes much coarse-grained volcanic detritus in early Pliocene. Deposition of marine sediments in southwestern part of valley during early and middle Pliocene.	Relative structural stability, only minor crustal movement. Great volcanic activity wanes; consequent streams erode volcanic deposits and move them toward San Joaquin Valley.
Pleistocene	Major faulting and folding accentuates existing structures. Erosion of mountains with deposition in intermontane valleys.	Deposition of coarse alluvial deposits by streams draining Sierra Nevada contemporaneous with dissection of tilted older alluvial-fan deposits. Lowering of sea level during Pleistocene glaciation causes San Joaquin River and major tributaries to excavate trenches graded to lower base level. Alluvial fans on east side tilted with Sierra Nevada block. Coast Range streams continue to build alluvial fans in downwarping area on west side of valley.	Several stages of glaciation in higher parts of range. Glacial scouring locally important in modifying land forms. Last major uplift of range along faults on eastern margin with additional westward tilting.
Recent	Subaerial erosion forms present topography. Minor structural movements continuing to present; many faults and folds still active; earthquakes frequent.	Deposition of stream-channel, alluvial-fan, overflow, and lacustrine deposits contemporaneous with mild dissection of tilted alluvial fans on east side of valley. Deposition of broad coalescing alluvial fans on west side and south end of valley. Sediments generally finer grained than in Pleistocene. Trenches of San Joaquin River and major tributaries backfilled as sea level rises with retreat of continental glaciers.	Subaerial erosion. Glacially scoured features being modified by weathering, erosion, and deposition.

Source: Davis, G.H., et al., Ground-Water Conditions and Storage Capacity in the San Joaquin Valley, California. U.S. Geological Survey Water Supply Paper 1618, p. 38,39. Washington, 1964.

INTRODUCTION

PURPOSE, ORGANIZATION AND LIMITATIONS OF THIS REPORT

The kinds of soils which develop in any area depend upon the parent materials, climate, biological forces, landforms, and relief, all acting over varying periods of time. These five factors work together in many different combinations, and the soils that result differ from place to place (often within short distances) in appearance, composition, management requirements, and productivity. These differences in soils have tremendous consequenses, both for farming and urban purposes.

It is the purpose of this chapter to briefly present sufficient descriptive and analytical information about the soils of the County so that the reader can appreciate that careful soils analysis is vital for both rural and urban planning. Land use planning, whether for the County as a whole, for communities, or for a single building and farm, must consider the underlying soils.

For farmland planning, this has always meant evaluation of the basic capabilities of the land and environment as a determinant of the types of crops, pastures, or grazing use to which the land should be devoted. Knowledge of the fertile productive land is also important to guide growth in the hope that, so far as possible, urban growth can be kept away from the food crop lands and the available mineral resources. In recent years, soil science and mechanics have given emphasis to the use of soil survey information for guiding urban growth and for engineering purposes as well. Unfortunately, since the Soil Conservation Service has only undertaken this aspect of its work in Madera County within the last year, most of this non-agricultural analysis is still in preparation and cannot yet be presented here.

We will proceed in this chapter by first indicating the present status of knowledge of the County's soils, then explaining the soil classification system, giving brief descriptions of the 50 soil areas shown on the general map; next, presenting the agricultural land-capability classification and map, and the distribution of special soil problem areas, and finally presenting as well as available non-agricultural interpretive data.

EXISTING KNOWLEDGE OF THE COUNTY'S SOILS

Presently, a great deal of basic knowledge of the individual soils of the County exists, having been developed over the years by the U. S. Soil Conservation Service and other organizations. In 1956, the University of California published "Soils of Madera County", and in 1962 the S. C. S. standard "Soil Survey" appeared. The latter includes detailed soil maps at a scale of 1:20,000 covering all of the County west of the Sierra National Forest boundary.

Recently, the attention of the Soil Conservation Service has turned toward applied interpretations of this mass of data for a variety of planning and administrative purposes. This has included work on such non-agricultural soil suitability interpretations as limitations for septic tank filter fields, limitations for building foundations, soil shrink-swell behaviour, classes and soil corrositivity for untreated steel pipe. With the exception of a preliminary map of septic tank filter field limitations, none of these interpretations has been completed by the S.C.S., therefore, cannot be in this report.

Concurrently, some new work on the traditional agricultural suitability interpretations has been undertaken. Notably this includes a mapping of the agricultural Land-Capability Classification of soils, a *preliminary* version of which appears in this report. In preparing this map, a new and expanded grouping of major soil patterns was developed as a basis for this and other interpretations. A *preliminary* version of this general soil areas map delineating 48 soil-type areas (series or associations) is also included in this report.

CLASSIFICATION

It is convenient to classify soils into Great Soils Groups, Associations, Series, Types, and Phases. Table shows soils arranged in Great Soil Groups and Series, and by parent material. Great Soil Groups are extensive areas of soil having world-wide distribution under similar climatic and topographic conditions. Some 18 of these are usually described, of which 11 are found in Madera County. Associations are extensive areas of two or more soils similar in general soil characteristics, and including minor areas of soil that may or may not be like the dominant soils within the area. Soil Associations differ from one another by having contrasting soil properties or differing in particular potentialities.

A *soil series* consists of those soils which have similar characteristics in the kind, thickness, and arrangement of soil layers. Soils that differ only in surface texture, but are alike in other characteristics, are defined as *soil types*. Soil types are further divided into *soil phases* because of differences in slope, degree of erosion, number and size of stones, or some other feature affecting their use that practical suggestions about their management could not be made if they are shown on detailed maps as one unit.

THE PRELIMINARY GENERAL SOIL MAP

The general soil map (Map 18) is a small-scale map delineating different geographic areas, showing the general patterns of soils that occur within each area. Each area consists of a predominant association *or* important single series and includes minor areas of other soils that may or may not be like the dominant soil.

General soil maps are prepared through orderly abstraction of detailed surveys, and are suitable only for general program planning. They are no substitute for detailed surveys, but have a very useful purpose when available at the proper time in the planning process. The interpretations made from these soil maps are suitable for general planning. The same interpretations and others can be made from detailed surveys and are suitable for operational planning on individual farms, ranches, subdivisions, and for other land uses.

The general soil map is useful for providing information about the soil resources of communities, whole counties, or parts of counties. This information can be used for preliminary planning for agriculture, or urban uses. For example, the general soil map can show large areas of prime agricultural land, extensive areas where most soils may have severe restrictions for septic tank filter fields, or places in a county where the clay soils would be a problem in constructing roads or for building foundations, or areas having subsidence or slumping problems.

The soils of parts of urbanized areas have been altered by much cutting and shaping of the landscape, nevertheless, these areas are shown on the general soil map as a soil pattern presumed to be before such changes were made. Some general predictions can be made for these reshaped areas from the general soil map, however, detailed soil maps are needed to delineate their extent and determine more precisely their characteristics and qualities. It must be cautioned that this is a preliminary map based upon advance work of the Soil Conservation Service, and that further refinements may change it somewhat before final publication. On the map shown here, soils of the same predominant series have been combined, regardless of differences in Type or Phase.

DESCRIPTIONS OF SOIL AREAS

There follows a brief general description of each of the soil type areas shown on the map. Next to each entry is the letter symbol by which the area is represented on the map. There are fifty such types shown on the map, but there are over a dozen other series covering only small or widely scattered areas of the County, which are not singled out for description or delineation as such on the map.

AHWAHNEE-AUBERRY SOIL ASSOCIATION Ah-Aj

This association occupies the higher parts of the foothills. The elevation ranges from about 1500 to 2800 feet. Slopes range from gentle to steep. Outcrops of granitic bedrock are common. Erosion hazard is slight to severe, depending on slope and any disturbance of soil. The Ahwahnee and Auberry soils differ from each other chiefly in the clay content of the sub-soil. Ahwahnee soils have only slightly more clay in the subsoil than in the surface soil. The Ahwahnee soils have a moderate accumulation of clay in the sub-soil. The Ahwahnee series consists of well-drained, upland soils derived from coarse-grained granitic rocks. These soils occur at elevations of about 1000 to 2800 feet in the foothills of the Sierra Nevada.

The Auberry soils were derived from similar parent rocks and are generally at elevations of 2250 to 2800 feet. At elevations of 2250 feet and more, all Ahwahnee and Auberry soils are so closely associated that they are mapped together.

AHWAHNEE VISTA SOIL ASSOCIATION Ah-Vt

This association dominates the lower foothills. It occupies a belt 10 to 15 miles wide, extending from the northern border to the southern border of Madera County. The elevation ranges from 500 to 1500 feet. Slopes range from gentle to steep. Outcrops of granitic rock are common. The Ahwahnee and Vista soils differ from each other chiefly in the color of the surface soil, with the Ahwahnee soils having their greyish-brown surface. In reaction, the Vista soils are neutral and the Ahwahnee soils are slightly acid. Erosion hazard is slight to severe, depending on slope.

Fig. 33. Ahwahnee-Vista, very rocky fine sandy loam soil, granite outcrops

ALLUVIAL SOILS Az

This unit is composed of loamy sands and sands lying adjacent to the San Joaquin River and subject to slight flood hazard. It is composed principally of Tujunga, Calhi, and Cajon soils with some Hanford.

ATWATER AH

The soils of the Atwater series are well drained and very deep. They were derived from somewhat older wind-reworked granitic alluvium and typically occur on the leeward side of hills or abandoned stream courses, principally on old terraces. The Atwater surface soil is coarse textured but there is enough clay in the subsoil to increase water-holding capacity and fertility. In places a hardpan sub-strata of an old unrelated soil underlies the profile.

The Ramona soils occur in long, narrow tracts, most of which traverse areas of the San Joaquin and Madera soils, and are slightly higher than the associated soils. They have more clay in the subsoil and are at a more advanced stage of soil development than the Greenfield soils, which were derived from similar parent material. They are less well developed than the San Joaquin or Madera soils and lack an iron-silica hardpan in the subsoil. None to slight erosion hazard.

REDDING SERIES Ri

The Redding series consists of reddish claypan-hardpan soils developed in gravelly and cobbly old alluvium derived from many kinds of rock, mostly hard metasedimentary and igneous. These soils occupy small remnants of old high terraces which were probably once extensive.

These soils are similar to and associated with the Corning soils and differ from them chiefly in having a dense, iron-silica hardpan in addition to the claypan in the subsoil. They also resemble the San Joaquin soils, but are usually more reddish and distinctly more gravelly and cobbly, particularly in the lower part of the profile, and they were derived from mixed rather than granitic material. Slight to moderate erosion hazard in some areas.

ROSSI SERIES Ru

The Rossi series consists of dark-colored, imperfectly drained, nearly level, saline-alkali soils developed in mixed but predominantly granitic alluvium. The salts and alkali are concentrated mainly in the upper part of the profile. These soils are in basins in the trough of the San Joaquin Valley. Before floods were controlled and pump irrigation was extensively practiced, floods were frequent,and the water table was high. No erosion hazard.

SAN JOAQUIN SERIES Si

The San Joaquin series consists of shallow, iron-silica hardpan soils developed in old alluvium derived mostly from granitic rocks. These soils are extensive. They occupy hummocky, very gently sloping areas and remnants of rolling, dissected alluvial deposits in the old, low terraces. Water may stand in the intermound areas during wet weather. Internal drainage is restricted by the impervious hardpan. Included here is about 3% Alamo clay, and in some areas there is about 20% inclusions of Ramona. One area near the Madera, Merced, and Mariposa Counties boundary includes about 40% Comita soil, and another small such area occurs near the San Joaquin River and Highway 99.

SAN JOAQUIN-MADERA ASSOCIATION Si-Mb

This association occurs in the northern and south-central parts of the County. The surface conforms to the slope of the old alluvial fan deposits from which the soils in this association were derived. The areas slope gently upward from west to east, and the relief is undulating or hogwallowed.

The San Joaquin and Madera soils differ mainly in color, reaction, and natural fertility. These differences are not marked, nor are they especially important, because the very slowly permeable claypan-hardpan subsoil, comparatively near the surface, is the striking characteristic of these soils and dominates in determining their use and management.

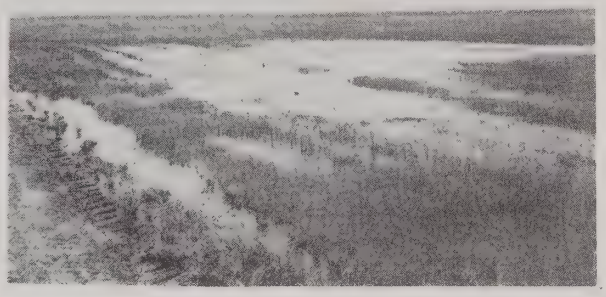


Fig. 36. Standing water on San Joaquin sandy loam near Ave. 24 and Rd. 22

SESAME SERIES Sx

The Sesame series consists of well-drained soils in the lower foothills of the Sierra Nevada. The parent material was weathered from the underlying coarse-grained granitic rocks. These soils are associated with the Vista soils, from which they differ chiefly in having a moderate amount of clay in the subsoil and a dark greyish-brown surface soil. Rock outcrops occur in places. Slopes are gentle to rolling. Slight to moderate erosion hazard.

Fig. 37. Complex of Sesame Vista soils near Four Corners showing outcrops of coarse-grained dark granitic rocks on which these soils were formed

TOLLHOUSE SERIES Tr

The Tollhouse series consists of dark-colored, shallow soils that developed from material weathered from granitic rocks. These soils occur in the lower parts of the mountains. The slopes are typically very steep. Outcrops of bedrock are common. Severe erosion hazard.

HORNITOS SERIES Ha

The soils of the Hornitos series occupy rolling to hilly areas in the lower foothills. They were derived from conglomerate and sandstone of the Ione formation. These soils are typically shallow to very shallow and rest abruptly on weathered bedrock. Rock outcrops are numerous in places. The parent material was derived from weathered, resistant minerals, mainly quartz and kaolinite, and both the rock and the soil are medium to strongly acid. Slight to severe erosion hazard.

LEWIS SERIES Ls

The soils in the Lewis series contain a lime-silica hardpan, much like that of the Fresno soils. They are developed from a mixed alluvium. They occupy the lower ends of old terraces and are nearly level, but have a hogwallow microrelief. These soils are associated with and transitional in character between the Madera and Fresno soils. They differ from the Fresno soils in having a fine-textured subsoil with a strong blocky structure just above the hardpan. A strongly alkaline subsoil and a lime-silica rather than an iron-silica hardpan are the principal characteristics that distinguish them from the Madera soils. None to slight erosion hazard.

MADERA SERIES Mb

The Madera series consists of iron-silica hardpan soils on old, low terraces. The parent material was somewhat mixed, but most of it was derived from granitic rocks. The subsoil is neutral and in some places is slightly calcareous just above the hardpan. The hardpan is yellowish brown and contains slight amounts of segregated lime. Unleveled areas have a hummocky, or hogwallow, microrelief and in the intermound areas may merge with small bodies of Alamo clay.

In many ways the Madera soils resemble the associated San Joaquin soils, but they are brownish in both the surface soil and the subsoil. None to slight erosion hazard.

MARGUERITE SERIES Me

The soils of the Marguerite series developed from alluvium derived from dark-colored (graphitic) slate and schist of the Mariposa formation. These soils occupy gently sloping, slightly elevated positions on the somewhat older terraces and alluvial fans near the foothills along Berenda Creek and its tributaries. Drainage is good, but there are saline-alkali spots, probably old seep spots, in which the profile is slightly calcareous. These soils are used for dryfarmed grain and range.

PACHAPPA SERIES Pa

The Pachapa soils occupy level alluvial fans of granitic origin. They have a pale brown to greyish brown, fine, sandy loam surface with a brown, loamy, alkaline subsoil.

PACHAPPA-GRANGEVILLE ASSOCIATION Pa-Gw

These soils are on nearly level alluvial fans of floodplains where the parent material is derived from granitic rocks. These soils differ in that Pachappa soils are from slightly older material and have an accumulation of clay in the subsoil, while the Grangeville soils are typically less calcareous. These soils occur as non-saline alkali and saline alkali affected. These soils are not well drained and there is little or no erosion hazard. Some areas contain up to 30% Traver soil as well as other inclusions. In this association, about 40% is Pachappa, 30% Grangeville, 20% Hanford, and 10% Visalia soils. There is none to slight erosion hazard in this association.

PACHAPPA-TRAVER ASSOCIATION Pa-Tx

The Pachappa saline-alkali phase occurs in this association. It is somewhat coarser textured than normal and slightly saline-alkaline throughout. The associated Traver soil is somewhat similar to the Pachappa but is lighter colored and contains more salts and alkali. These soils are not well drained. Surface runoff is very slow and internal drainage is medium to moderately slow. The fertility and water-holding capacity is moderate. Erosion hazard is none to slight. See each soil description elsewhere.

Fig. 35. Pachappa-Traver soils in vicinity of Ave. 12 and Rd. 18

POZO SERIES Pl

The soils of the Pozo series occur in the basin area, at the lower end of old alluvial fans. The parent material was alluvium derived chiefly from granitic rocks. Surface drainage was very slow and the water table was high while these soils were developing. The Pozo soils differ from the associated Rossi soils in having a lime-silica hardpan. They are like the Fresno and El Peco soils except for having a dark-colored, non-calcareous surface soil. None to slight erosion hazard.

RAMONA SERIES Rc

The soils of the Ramona series occupy level to gently sloping areas on the old, low terraces and are derived principally from granitic rocks.

DINUBA-EL PECO ASSOCIATION Dp-Eh

These soils consist of pale and very pale brown, moderately coarse to medium textured soils derived from granite rock material. They are located mostly on the lower margin of the San Joaquin River alluvial fan. The El Peco soils typically contain more lime and have a strongly cemented hardpan in the lower part of the subsoil.

The Dinuba soils are a slight clay increase in the subsoil which is over a mass of silt loam which varies widely in hardness. This association is affected by saline-alkali salts of slight to severe conditions. None to slight erosion. These soils also occur as El Peco-Dinuba Association, the difference being the predominant soils in each association are reversed.

FOSTER SERIES Fp

The Foster series consists of imperfectly to poorly drained, dark colored, nearly level soils developed from recent alluvium derived mainly from granitic and other rocks containing considerable mica. These soils occupy part of the floodplain of the San Joaquin River. They are similar to the well-drained Hanford soils but are dark colored, poorly drained, and moderately high in organic matter. None to slight erosion hazard.

FRESNO-EL PECO ASSOCIATION

The Fresno series consists of light colored, imperfectly drained, lime silica, hardpan soils that have developed from older alluvium derived mainly from granitic rocks. See the El Peco soil description under the heading "El Peco Soils". They occur in a nearly level area in the basin, generally west of the Dinuba soils and east of the dark-colored, more recent Columbia, Temple, and other alluvial soils in the San Joaquin floodplain. Some areas include up to 15% Calhi soils.

GRANGEVILLE SERIES Gw

The soils of the Grangeville series occupy nearly level, low parts of recent alluvial fan floodplains. The parent material was derived from granitic rocks, and other micaceous rocks. Under natural conditions, these soils were imperfectly drained and subject to flooding and a periodic high water table, but as a result of pumping, those in this area are now mostly moderately well drained. There are mottles and slight amounts of water in the subsoils and substrata. Salts and alkali, principally in the top soil, but in places in the surface soil are common.

GRANGEVILLE-CHINO ASSOCIATION Gw-Ce

This association occurs in one fairly large body in the southwest corner of the County. About 20% of the association is Chino soil and most of it is affected to some degree by saline-alkali salts. Some of the Grangeville soil in this association is also saline-alkali. See the description of each soil elsewhere.

HANFORD SERIES Hd

The soils of the Hanford series consist of moderately coarse textured, recent alluvium, derived chiefly from granite rocks high in micaceous minerals. The alluvial deposits were stratified and channeled during deposition. The profile is nearly uniform throughout and shows little modification other than a slightly darker color and a higher organic net content in the surface soil. Some areas contain up to 30% Tujunga soils. None to slight erosion.

HANFORD-TUJUNGA ASSOCIATION Hd-Td

This association dominates the Fresno and San Joaquin River fans in the south-central part of the County. Relatively deep and uniform deposits of alluvium derived largely from granitic rocks characterize the area. Natural drainage is good to somewhat excessive.

On the Fresno River fan Hanford soils dominate, and winding, narrow stringers of coarse-textured Tujunga soils occupy the old stream channels. The San Joaquin River fan is similar, except that an unrelated substratum high in silt underlies the Hanford soils at moderate depths.

Most of the problems of managing the soils in this association result from the contrast in fertility and in water requirements between the Hanford and Tujunga soils.

HIDEAWAY SERIES Hn

The Hideaway series consists of very shallow, brown, medium textured soils derived from basaltic lava flows that cap mesas in the foothills of the Sierra Nevada at an elevation of about 2200 feet. Stones almost cover the surface in many places, and in other places bedrock is at the surface. The soils are nearly level to gently sloping. Near the margins of the basaltic flows there are steep, escarpmentlike breaks. The vegetation consists of annual grasses and herbs and, along the edges of the mesas, some brush and Digger pine.

The principal associated soils are the Ahwahnee and Auberry soils, which were derived from the granitic rocks that generally underlie the lava flows. These soils are used for range exclusively.

HOLLAND SERIES Hs

The soils of the Holland series develop from residuum weathered from coarse-grained granitic rocks. They occupy the strongly sloping higher foothills and lower mountains. In this area they are generally at altitudes of 2,800 to 3,500 feet or more. The annual precipitation ranges from 25 to 40 inches; some of it is snow. These soils have a greyish-brown, moderately fine textured subsoil. Erosion hazard is slight to moderate.

BORDEN SERIES Bi

The soils of the Borden series consist of well-drained brownish soils that develop from granitic alluvium on somewhat older alluvial fans. These soils have a moderate amount of clay in the sub-soil and they contain segregated lime, most of which is in the lower part of the subsoil. Salts and alkali are common in the sub-soil, possibly because of restricted drainage in the past, amounting to slight erosion hazard.

BORDEN - PACHAPPA SOIL ASSOCIATION Bi-Pa

This association occurs only in one area and is rather limited in extent. Both soils are saline-alkali and are described under the descriptions of each soil. None to slight erosion hazard.

CHINO SOILS Ce

The Chino soils occupy nearly level swale-like positions in the basins and on old alluvial fans. Locally they are subject to slight deposition of recent alluvium. Parent material was granitic alluvium. These soils are dark colored and moderately high in organic matter and are generally affected in some degree by saline alkali salts. There is slightly more clay in the subsoil than in the surface soil and there is a zone of lime concentration in the lower part of the subsoil. None to slight erosion hazard.

COARSEGOLD SERIES Cq

The soils of the Coarsegold series are reddish-brown. They developed from material weathered from metamorphosed sedimentary rocks and intrusive basic igneous rocks. This mica schist, locally known as slate, occurs in the foothills and lower mountains in the central part of Madera County. Normally there are but few rock outcrops. The topography is gently rolling to steep. Slight to severe erosion hazard, depending on slope.

COARSEGOLD-TRABUCO ASSOCIATION Cq-Tv

This association occurs in the same general part of the area as the Ahwahnee-Auberry Association, the elevation ranging from 1500 to 3500 feet. Slopes range from gentle to very steep and rock outcrops are common in places.

These soils differ chiefly in parent material and in clay content of the subsoil. The Coarsegold soils were derived from mica schist, and the Trabuco soils were derived from basic igneous rocks. The Coarsegold soils have a moderate accumulation of clay in the subsoil, and the Trabuco soils have a strong accumulation of subsoil clay. Because of the iron and other basic materials in the parent rocks, both soils are reddish, the Trabuco more so than the Coarsegold.

COLUMBIA SERIES Cw

In the Madera Area, soils of the Columbia series occur on recent alluvium, derived chiefly from granite rocks. They are imperfectly drained, non-calcarius, brownish and mottled with strong brown, principally in the subsoils. In their natural condition they were flooded or had a high water table nearly every year. Friant Dam on the San Joaquin River and Pine Flat on the Kings River have greatly reduced the flood hazard but a high water table still occurs in some years.

These soils occur in small and regular tracks, are typically stratafied, and variable in texture. Slight to moderate erosion hazard.

COLUMBIA-TEMPLE ASSOCIATION Cw-Ti

This association occurs in a narrow band along the east side of the San Joaquin River. Temple soils differ from the Columbia in being dark colored, have high organic matter, are finer textured throughout, and have lime in the profile. Temple soils frequently underlie Columbia soils. These soils have wetness problems due to seepage and from over-irrigation. Slight to moderate erosion hazard.

COMETA SERIES Cy

These soils are formed from softly consolidated, moderately coarse textured granitic sediments and have a brown, sandy surface soil and a reddish brown, dense clay pan in the subsoil. They occupy undulating to rolling, dissected, old, low terraces.

COMETA-WHITNEY ASSOCIATION Cy-Wh

These soils occupy old, low terraces, and in places this association includes 10 to 15 percent Atwater loamy sand. The Atwater occurs as islands, is droughty, and has a slight to severe wind erosion hazard when bare. See Cometa description elsewhere in this report.

The Whitney soils are developed in weakly consolidated sedimentary material derived from granitic rock. They have a brown, hard, fine,sandy loam surface, a light yellow-brown, hard, heavy, fine, sandy loam subsoil. The depth to the weakly consolidated substratum bears 20 to 50 inches but is typically only moderately deep.

DAULTON SERIES Dd

The Daulton series consists of shallow soils developed from metamorphosed sedimentary rock, principally slate of the Mariposa formation. The slate is fairly dark colored because it contains graphite and the soils are dark, greyish brown. These soils occur along the western foothills of the Sierra Nevada. The topography is undulating to hilly. Drainage is good to somewhat excessive. Outcrops of nearly vertically tilting bedrock, tombstone-like in appearance, are numerous in places. Slight to severe erosion hazard.

Fig. 34. "Tombstone"-like outcrops of metamorphic rock on Daulton rocky fine sandy loam - hillside near Road 600 and 603

GROUP B. Soils having moderate infiltration rates when thoroughly wetted, and consisting chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse texture. These soils have a moderate rate of water transmission. The following soils are placed in this group: Ahwahnee and Auberry coarse sandy loams (both rocky and non-rocky), Ahwahnee-Vista coarse sandy loams (both rocky and non-rocky), Atwater loamy sand, alluvial soils, Chino loam, Columbia sandy loam, Dinuba sandy loam, Foster loam, Grangeville sandy loam, Hanford sandy loam, Holland sandy loam, Ramona sandy loam, Traver loams, Visalia sandy loam, and Pachappa sandy loam.

GROUP C. Soils having low infiltration rates when thoroughly wetted, consisting chiefly of soils with a layer that impedes the downward movement of water or soils with a moderately fine to fine texture and a slow infiltration rate. These soils have a slow rate of water transmission. The following soils are placed in this group: Borden loams, Chino clay loam, Montpelier sandy loam, Trabuco loam, Whitney sandy loam, Coarsegold loam.

GROUP D. Soils having very slow infiltration rates when thoroughly wetted, consisting chiefly of clay soils with a high swelling potential, soils with a high permanent water table, soils with a clay pan or clay layer at or near the surface, and shallow soils over nearly impervious materials. The following soils are placed in this group: Comita sandy loam, Daulton sandy loam and loam, El Peco sandy loam, Fresno sandy loam, Lewis loam soils, Madera soils, Pozo loam, Redding gravelly sandy loam, Raynor clay, Rocklin sandy loam, Rossi clay loam and clay, San Joaquin sandy loam, Sesame loam, Trigo sandy loam, and Tollhouse sandy loam.

SPECIAL SOIL PROBLEMS IN THE COUNTY

Extended discussions of the origins of and methods of dealing with the alkaline-saline and hardpan-claypan problem soils are presented in the existing soil surveys. Consequently, in this report only generalized location maps of these problem areas are given. Map 20 shows the location of hardpan-type soils, while Map 21 shows the location of soils having saline-alkali problems.

There are no major areas of soil subsidence or soil slumping in Madera County, however, some small areas of subsidence exist in the foothills near the Merced border on the north, and slumping does occur on some mountain soils, especially following clear-cutting or burning.

NON-AGRICULTURAL SUITABILITY INTERPRETATIONS

As we have already mentioned, the only non-agricultural interpretive grouping which has been tentatively completed is Map 22 , showing areas generally not suitable for septic tank filter fields as well as those areas in which they might be made suitable.

Some information regarding soil limitations for building foundations in Madera County is available, but because it is incomplete, it is presented for reference only in the appendix. It consists of descriptions and tables of the criteria to be used in developing soil interpretations for this purpose.

How satisfactorily a sewage disposal system works depends largely on the rate at which the septic-tank effluent moves into and through the soil. But there are several other soil characteristics that may affect the soil suitability, such as ground water level, depth of soil, types of underlying material, slope of the land surface, proximity to streams or lakes, and so on.

It cannot be emphasized too much that the location of a sewage disposal system should be thoroughly investigated and tested before installation. Fluctuating high water tables make the disposal system inoperative if the water level is at or near the surface, and sewage effluent may be forced to the surface of the ground creating a health hazard. Contamination of local wells may be a problem in foothill areas that are very porous or that have bedrock at shallow depths or directly beneath the disposal system. Where there is very little material between the bottom of the disposal system and fractured bedrock, sewage effluent will not be adequately filtered before reaching the water table. The presence of restrictive layers of hardpan or claypan can be, of course, a major limitation for septic systems in this County as internal drainage is restricted by the impervious hardpan unless it is broken and removed.

For all of these reasons, it is useful to have both general interpretations of these limitations such as those presented here in Map for overall planning purposes, and detailed soil maps with on-site testing to locate and design specific systems.

SOIL INTERPRETATIONS AND LIMITATIONS FOR SPECIFIC USES

Information on the soil map must be explained-interpreted - in a way that has meaning to the user. Soil maps can be interpreted by (1) the individual kinds of soil on the map, and (2) the groupings of soils that behave similarly in responses to management and treatment. It is a highly generalized version of the second method which is used in this report, in order to provide the sort of information needed for overall planning decisions. Soils are grouped in different ways according to the specific needs of the map user.

It is, however, important to understand that general interpretive maps are no substitute for large-scale soils maps for planning of the actual acreage being considered for cultivation in the case of agricultural interpretations. Nor, in the case of non-agricultural interpretations, are they a substitute for detailed, on-site investigation to determine the specific location of effluent disposal systems or building sites.

LAND-CAPABILITY CLASSIFICATION

The Land-Capability Classification developed by the U.S. Soil Conservation Service (shown in Map 19), is a grouping of soils that shows, in a general way, how suitable they are for most kinds of farming. It is a practical grouping based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment.

In this system, all the types of soil are grouped at three levels, the capability class, subclass, and unit. The eight capability classes in the broadest grouping are designated by Roman numerals I through VIII. In Class I are the soils that have few limitations, the widest range of use, and the least risk of damage when they are used. The soils in the other classes have progressively greater natural limitations. In Class VIII are soils and landforms so steep, shallow, or otherwise limited that they do not produce worthwhile yields of crops, grazing, or wood products.

The subclasses indicate major *types* of limitations within the classes. Within the subclasses are the capability-units groups of soils enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. In this report, and the accompanying land-capability map (Map 19), only the most generalized level, that of Class, is discussed or shown.

Soils are classified in capability classes, subclasses, and units in accordance with the degree and kind of their permanent limitations; but without consideration of major and generally expensive land-forming that would change the slope, depth, or other characteristics of the soil; and without consideration of possible but unlikely major reclamation projects.

The eight general land-capability classes are described as follows:

Class I. Soils in Class I have few limitations that restrict their use.

Class II. Soils in Class II have some limitations that reduce the choice of plants or require moderate conservation practices.

Class III. Soils in Class III have severe limitations that reduce the choice of plants or requires special conservation practices or both.

Class IV. Soils in Class IV have very serious limitations that restrict the choice of plants, require very careful management, or both.

Class V. Soils in Class V have had little or no erosion hazard but have other limitations that are impractical to remove.

Class VI. Soils in Class VI have severe limitations that make them generally unsuited for cultivation.

Class VII. Soils in Class VII have very severe limitations that make them unsuited for cultivation.

Class VIII. Soils and land forms in Class VIII have limitations that preclude their use for commercial plant production, and restrict their use to recreation, wild life, water supply, or esthetic purposes.

HYDROLOGIC SOIL GROUPS

Of some relevance to both agricultural and non-agricultural soil interpretations are the water infiltration and transmission characteristics of individual soils. It has not been possible at this time to map the distribution of these hydrologic properties, but a brief description of the major groups and the soils included in each group is given below.

Four major soil groups are used. The soils are classified on the basis of intake of water at the end of long-duration storms occurring after prior wetting and opportunity for swelling and are without protective effect of vegetation. The major groups are:

GROUP A. Soils having high infiltration rates, even when thoroughly wetted, consisting chiefly of deep, well to excessively drained sands and/or gravel. These soils have a high rate of water transmission and would result in a low runoff potential. The following soils are placed in this group: Cajon loamy sands, Tujunga loamy sands.

TRAVER SOILS Tx

The Traver soils consist of light-colored, saline-alkali soils that developed in alluvium that originated mainly in areas of granite rock. These soils are in the basin and the lower end of the somewhat older alluvial fans. They are calcareous to the surface. Micro-relief is slightly hummocky,but the general topography is nearly level. No erosion hazard.

TRAVER-CHINO COMPLEX Tx-Ce

This complex consists of Traver and Chino fine sandy loams and loams, in such close association that it was impractical to show them separately. Up to 25% of the area is saline-alkali to the surface, and most of the subsoil is affected by excess salts and alkali. This complex is used in much the same way as Traver loam, slightly saline-alkali, 0 to 1% slope, and has about the same requirements for management and reclamation. No erosion hazard.

TRIGO Ta

The soils of the Trigo series developed in softly consolidated, old, silty, granitic alluvium. These soils are shallow. They occupy the more strongly sloping parts of the old terraces. They are associated with the deeper, darker colored, and less acid Whitney soils and with the more reddish Cometa soils which have a claypan subsoil. Drainage is good, and the silty substratum is fractured sufficiently to allow water to penetrate in most places. Slight erosion hazard.

TRIGO-COMETA Ta-Cy

This complex consists of small bodies of Trigo and Cometa soils. It was impractical to separate them. The profiles are similar to those as described under Trigo fine sandy loam and Cometa loam respectively. Both soils are low in moisture-holding capacity and fertility, and hence have similar management problems.

TUJUNGA SERIES Td

The Tujunga series consists of pale-brown, noncalcareous, coarse-textured, somewhat excessively drained soils derived from granitic sediments deposited on recent alluvial fans and flood plains. The profile is nearly uniform throughout, except for a small amount of organic matter in the surface layer and some textural stratification caused during deposition of material by swiftly moving streams and flood waters. Although Tununga soils in other areas contain stones and even boulders, those in Madera County contain no coarse fragments, except for gravel in the subsoil and substratum. In places the Tujunga soils occupy narrow, irregular, winding, present or old stream courses that traverse large bodies of Hanford or other soils. This soil has a high erodibility hazard.

VISALIA SERIES Vs

The soils of the Visalia series occupy swale-like and other nearly level positions on low, recent alluvial fans and flood plains. These soils were derived from sediments washed from granitic and other micaceous rocks. Under natural conditions they were imperfectly drained and subject to flooding and a periodic high water table, but, as a result of pumping, are now moderately well drained. Except for variations resulting from stratification, the profiles are moderately coarse textured and dark-colored to considerable depths. The vegetation is mainly annual grasses and herbs and some moisture-loving plants.

In many respects these soils are transitional between the Grangeville and Hanford soils.

WHITNEY SERIES Wh

The Whitney soils are developed in weakly consolidated sedimentary materials developed chiefly from granitic rocks. The surface soil is brown, hard, fine, sandy loam to loam. The subsoil is light yellowish brown, heavy, fine, sandy loam which grades into very pale brown, mildly alkaline, weakly consolidated granitic sediments. The depth to this weakly consolidated substratum varies from 20 to 50 inches but is typically moderate.

WHITNEY-ROCKLIN ASSOCIATION Wh-Rr

This association occupies low, rolling, dissected terraces. The slopes are undulating to hilly and drainage is good. The Whitney soils are described above.

The Rocklin soils are light brown to reddish brown sandy loam. The subsoil is light brown sandy loam with a slight clay accumulation. This layer rests on a strongly cemented hardpan of varying thickness. The depth to pan also varies widely.

WHITNEY-TRIGO ASSOCIATION Wh-Ta

This association occupies low, rolling, dissected terraces. The slopes are undulating to hilly and drainage is good. Surface runoff is slow. The Trigo soils are developed in softly consolidated granitic alluvium. 40% Trigo, 60% Whitney. These soils are shallow and occupy the more strongly sloping parts of old terraces. The surface is pale brown, slightly acid, fine, sandy loam. The subsoil has pale brown, medium acid loam. This layer rests on a wide, softly consolidated, silty substratum with a few thin, limed seams. Depth to substratum ranges from 6 to 20 inches.

TABLE 9

SOIL SERIES BY GREAT SOIL GROUPS, AND CERTAIN FACTORS OF SOIL FORMATION

Great soil group and series	Parent material	Drainage	Degree of profile development
ZONAL SOILS			
Noncalcic Brown soils:			
Atwater	Granitic alluvium	Good	Minimal.
Borden	Granitic alluvium	Good	Medial.
Cometa	Granitic alluvium	Good	Maximal.
Corning	Mixed alluvium	Good	Maximal.
Dinuba	Granitic alluvium	Moderately good	Minimal.
Greenfield	Granitic alluvium	Good	Minimal.
Madera	Dominantly granitic alluvium	Good	Maximal; hardpan.
Marguerite	Alluvium from slate and schist	Good	Minimal.
Montpellier	Granitic alluvium	Good	Maximal.
Pachappa	Granitic alluvium	Good	Minimal.
Ramona	Granitic alluvium	Good	Medial.
Redding	Mixed alluvium	Good	Maximal; hardpan.
Rocklin	Granitic alluvium	Good	Medial; hardpan.
San Joaquin	Granitic alluvium	Good	Maximal; hardpan.
Sesame	Granite	Good	Medial.
Vista	Granite	Good	Minimal.
Whitney	Softly consolidated granitic sediments	Good	Minimal.
Chestnut soils:			
Buchenau	Alluvium from metasedimentary rocks	Moderately good	Minimal; hardpan.
Jesbel	Alluvium from metasedimentary rocks	Good	Maximal; hardpan.
Brunizems:			
Ahwahnee	Granite	Good	Minimal.
Auberry	Granite	Good	Medial.
Reddish Prairie soils:			
Coarsegold	Mica schist	Good to somewhat excessive.	Medial.
Trabuco	Basic igneous rock	Good to somewhat excessive.	Maximal.
Reddish-Brown Lateritic soils:			
Holland	Granite	Good	Medial.
INTRAZONAL SOILS			
Humic Gley soils:			
Alamo	Granitic alluvium	Poor	Medial; hardpan.
Bear Creek	Dominantly granitic alluvium	Imperfect to moderately good.	Minimal.
Chino	Granitic alluvium	Poor to imperfect	Minimal.
Foster	Granitic alluvium	Poor to imperfect	Dark-colored A_1 horizon.
Grangeville	Granitic alluvium	Imperfect to moderately good.	Dark-colored A_1 horizon.
Pozo	Granitic alluvium	Imperfect	Dark-colored A_1 horizon; hardpan.
Rossi	Granitic alluvium	Poor to imperfect	Medial.
Temple	Granitic alluvium	Poor to imperfect	Minimal.
Solonetz soils:			
Fresno	Granitic alluvium	Imperfect	Medial; hardpan.
Lewis	Granitic alluvium	Imperfect	Maximal; hardpan.
Traver	Granitic alluvium	Good	Minimal.
Grumusols:			
Porterville	Basic igneous alluvium	Good	None.
Raynor	Andesitic tuff	Good	None.
Zaca	Calcareous sandstone and shale	Good	None.
AZONAL SOILS			
Alluvial soils:			
Cajon	Granitic alluvium	Somewhat excessive	None.
Columbia	Granitic alluvium	Imperfect	None.
El Peco	Granitic alluvium	Imperfect	None; hardpan.
Hanford	Granitic alluvium	Good	None.
Hildreth	Granitic alluvium	Imperfect	None.
Tujunga	Granitic alluvium	Somewhat excessive	None.
Visalia	Granitic alluvium	Imperfect to moderately good.	None.
Wunjey	Granitic alluvium	Moderately good	None.
Regosols:			
Calhi	Granitic eolian sand	Somewhat excessive	None.
Delhi	Granitic eolian sand	Excessive or somewhat excessive.	None.
Lithosols:			
Daulton	Graphitic slate	Good to somewhat excessive.	None.
Hideaway	Basic flows	Good	None.
Hornitos	Acid sandstone and conglomerate	Good to somewhat excessive.	None.
Tollhouse	Granite	Excessive	None.
Trigo	Softly consolidated granitic sediments	Good	None.
Whiterock	Sandy slate and schist	Good to somewhat excessive.	None.

Source: U.S.Department of Agriculture, Soil Conservation Service. Soil Survey, Madera Area, California, Series 1951, No.11, May 1962; table 17, p. 124.

TABLE 10

SOIL LIMITATIONS FOR BUILDING FOUNDATIONS*
(Preliminary - Subject to Revision)

USDA Soil Texture	Soil Structure and Consistence	Uniform Building Code Class of Material	Rating
Very coarse sand, coarse sand (all may be loamy)	Semiconsolidated; consistence dry - hard, very hard, extremely hard	Compact coarse sand	Moderate
	Loose, noncoherent	Loose sand	Severe
Medium sand, fine sand, very fine sand (all may be loamy)	Semiconsolidated; consistence dry - hard, very hard, extremely hard	Compact fine sand	Moderate
	Loose, noncoherent	Loose sand	Severe
Sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, clay loam, sandy clay loam, silty clay loam	Consistence dry - hard, very hard, extremely hard; consistence moist - firm, very firm, extremely firm	Compact inorganic sand and silt mixtures	Moderate
	Consistence dry - slightly hard, soft; consistence moist - loose, very friable, friable	Loose inorganic sand and silt mixtures	Severe
	Consistence dry - extremely hard, very hard; consistence moist - extremely firm, very firm	Hard clay or sandy clay	Slight
Clay, sandy clay, silty clay	Consistence dry - hard, slightly hard; consistence moist - firm	Medium-stiff clay or sandy clay	Slight
	Consistence dry - loose, soft; consistence moist - friable, very friable; usually calcareous or highly calcareous	Soft sandy clay or clay	Moderate
	High shrink-swell; CMPM .040; very plastic; high montmorillonite clay; Vertisol (Grumusol)	Adobe	Moderate[1/]
Muck, peat	High organic matter	Loose organic sand and silt mixtures and muck or bay mud	Severe[1/]

*Based on Table 28-B, Uniform Building Code, 1964 Ed. Vol. I, Section 2804.

1/ All values are 0

2/ On the basis of Table 28-B, Column (3), the adobe soils are rated as having a moderate limitation for building foundations. The high shrink-swell nature of the adobe soils must be taken into account, as well as the allowable soil pressure.

Source: Calif. Engineering Handbook Notice No. 15; U.S.D.A., Soil Conservation Service, Berkeley Calif., Oct. 1965

SOIL LIMITATIONS FOR BUILDING FOUNDATIONS

PRELIMINARY CRITERIA FOR AN INTERPRETIVE MAPPING

These ratings, from Soil Conservation Service California Engineering Handbood, Notice #15, "Soil Limitations for Building Foundations", are for general planning purposes only. They are not to be used as a substitute for detailed, on-site investigations. Soil limitations for building foundations are based on the Uniform Building Code Table 28-B, Allowable Soil Pressures. The 11 classes of material given in Table 11, (column 1), the minimum depth below adjacent virgin gound, (column 2), and the characteristics of the soil have all been considered in arriving at a rating of 3 degrees of limitation. The criteria for converting the soil survey information to the 11 classes of material given in 28-B, column 1, are available for reference at SCS offices.

DEGREES OF LIMITATION - *Slight:* with more than 2,000 lb. per sq. ft. of soil of allowable soil pressure. *Moderate:* 1,000 to 2,000 lb. per sq. ft. of allowable soil pressure. *Severe:* less than 1,000 lb. per sq. ft. of allowable soil pressure. In all cases, except for rock, the minimum depth of footing to be at least 1 ft. below adjacent virgin ground. Thus the surface foot of soil is not a fact in rating the soil.

Table 28-B (Table 11 of *this* report), column 4 specifies an increase in value for each foot of increase in depth below the minimum depth. In most cases, this will not affect the rating given for soil unless there is a significant change in the soil profile with depth. For example, a compact, inorganic sand and silt mixture with moderate limitations rating may change to a hard clay, rated as having only slight limitations.

TABLE 11

ALLOWABLE SOIL PRESSURE
(Preliminary - Subject to Revision)

CLASS OF MATERIAL	MINIMUM DEPTH OF FOOTING BELOW ADJACENT VIRGIN GROUND	VALUE PERMISSIBLE IF FOOTING IS AT MINIMUM DEPTH, POUNDS PER SQUARE FOOT	INCREASE IN VALUE FOR EACH FOOT OF DEPTH THAT FOOTING IS BELOW MINIMUM DEPTH POUNDS PER SQUARE FOOT	MAXIMUM VALUE POUNDS PER SQUARE FOOT
1	2	3	4	5
Rock	0'	20% of ultimate crushing strength	0	20% of ultimate crushing strength
Compact coarse sand	1'	1500[1]	300[1]	8000
Compact fine sand	1'	1000[1]	200[1]	8000
Loose sand	2'	500[1]	100[1]	3000
Hard clay or sandy clay	1'	4000	800	8000
Medium-stiff clay or sandy clay	1'	2000	200	6000
Soft sandy clay or clay	2'	1000[2]	50	2000
Adobe	1'6"	1000	50	
Compact inorganic sand and silt mixtures	1'	1000	200	4000
Loose inorganic sand silt mixtures	2'	500	100	1000
Loose organic sand and silt mixtures and muck or bay mud	0'	0	0	0

[1]These values are for footings one foot (1') in width and may be increased in direct proportion to the width of the footing to a maximum of three times the designated value.

[2]For depths greater than eight feet (8') use values given for clay of comparable consistency.

Source: Table No. 28-B, Calif. Engineering Handbook Notice No. 15; U.S.D.A., Soil Conservation Service, Berkeley, Calif., Oct. 1965. (Taken from Uniform Building Code, 1964 Ed. Vol. I, Section 2804)

WATER SUPPLY

All of the water supply of Madera County originates as some form of precipitation and the precipitation map (No.16) illustrates the unequal distribution of precipitation occurring within the County. Much of the western portion of the Valley receives less than ten inches of rainfall annually,while portions of the county in the higher elevations receive fifty or more inches a year. Of the precipitation that falls, a portion is evaporated from the surface of the ground. The exact amount is dependent upon the temperature of the air, the nature of the surface, and the type of vegetational cover upon which it falls. Another portion is absorbed by the soils on which it falls and the rest drains off in streams and water courses. The water that enters the surface of the soil and the water that flows off or remains on the surface are the water sources for Madera County.

SURFACE WATER

The Valley portion of the county receives its annual water supply, for the most part, from the three principal streams which drain the higher elevations of the County. A few smaller streams draining the lower foothills during the rainy season provide a small secondary source of water, primarily groundwater recharge, as these streams dissipate shortly after entering the valley floor. The three major streams include the San Joaquin River, Fresno River,and the Chowchilla River. Elevations in the drainage basins of the latter two streams rise to a maximum of about 7000 feet while in the San Joaquin River drainage basin, which extends to the crest of the Sierra Nevada, elevations exceed 13,000 feet.

Stream flow, the critical quantity in the water supply of the valley, depends almost wholly on the amount and distribution of precipitation in the Sierra Nevada. However, precipitation and runoff in the valley vary not only from winter to summer but from year to year as well. The runoff in a very dry year may be as little as one-third or less of the average and in very wet years, the runoff may be greater than twice the average. Furthermore, the variation in precipitation and runoff is cyclical and characterized by a succession or wet or dry years when the runoff is considerably above or below average respectively. So far as water conservation is concerned, the occurrence of several dry years in a row is the controlling factor in determining the dependable water supply that can be developed.

Because of the lower topography, the winter and spring runoff from the Fresno and Chowchilla Rivers is due in most part to winter and spring rainfall, while that of the San Joaquin River is prolonged into July as a result of snowmelt in the higher elevations.

Practically all of the surface water passing over or through the mountains and foothill areas of the County is eventually stored and diverted by the Chowchilla and Madera Irrigation Districts for use by the valley farmers during the growing season.

FRESNO RIVER

The Fresno River drains an area extending from the San Joaquin River at the extreme northwest corner of the County on the valley floor to the western slope of the Sierra Nevada. The area lying above the 5000 foot elevation, where precipitation falls as snow, comprises only about 5 percent of the total *drainage area*, and the amount of precipitation which falls as snow is correspondingly small as shown on map number 17 . The Fresno River drainage basin, including the valley floor portion, has a length of about 60 miles and an average width of about 10 miles. The watershed above the foothill gaging station, which is about one and a half miles below Hensley's Bridge, comprises about 237 square miles. Elevations in the basin range from a minimum of about 100 feet above sea level at the San Joaquin River to a maximum of about 7,100 feet at the tributary headwater.

Normal seasonal precipitation varies from about 10 inches on the valley floor to about 50 inches at the 6,000 foot level, and averages about 30 inches over the basin. Streamflow records over the past 22 years show that the average annual runoff of the Fresno River at the gaging station is about 69,860 acre-feet, and has ranged from a maximum of about 297,100 acre-feet to a minimum of about 6,200 acre-feet. Cottonwood Creek is interconnected with the Fresno River near the crossing of the Madera Canal, and during floodflows serves as a distributary of Fresno River water. During the growing season, the Madera Irrigation District diverts practically all of the Fresno River flow and distributes it to the service area within the District. Water for irrigation is highly essential to the economy of the County. Without irrigation, the County's croplands would produce relatively little. Irrigation water is also enabling the transfer of lands from extensive uses to more specialized intensive uses.

CHOWCHILLA RIVER

The Chowchilla River, running parallel to and lying just a few miles north of the Fresno River, is in many respects similar to the Fresno River. Like the Fresno River, the Chowchilla River drains an area extending from the San Joaquin River on the valley floor to the western slope of the Sierra Nevada, the drainage basin being about 60 miles long and having an average width of approximately 10 miles. The watershed, above the gaging station near the 600 foot contour interval, has an area of about 235 square miles, just 2 square miles less than the Fresno River drainage basin. However, a large portion of the Chowchilla drainage basin lies outside Madera County and within Mariposa County.

Elevations in the drainage basin range from a low of about 100 feet above sea level along the San Joaquin to a maximum of about 6,800 feet on the tributary headwaters. Above the 5,000 foot elevation precipitation usually occurs as snow. However, only about 5 percent of the drainage basin lies above 5,000 feet so the amount of precipitation which falls as snow is correspondingly small. Normal seasonal precipitation varies from 10 inches on the valley floor to about 50 inches at the 6,000 foot level, and averages 30 inches over the basin. The annual runoff of the Chowchilla River at the gaging station averaged 60,590 acre-feet over a 35-year period, and ranged from a maximum of about 259,000 acre-feet to a minimum of about 3,000 acre-feet. Below the foothill line, Ash and Berenda Sloughs are the main distributary channels of the Chowchilla River. Local interests have constructed control works for the division of flow between the Chowchilla River and Ash Slough, and between Ash and Berenda Sloughs.

SAN JOAQUIN RIVER

The San Joaquin River is the principal drainage outlet for the San Joaquin Valley. Most other rivers of the San Joaquin Valley are tributaries to the San Joaquin. The San Joaquin River below Mendota Pool is one of the few rivers in the United States to flow in a northerly direction. The river rises in the high Sierras southwest of Yosemite National Park and is formed by the junction of the middle and south forks. Of the two original forks, the South Fork drains the larger area and is considered the head of the main stream. In its journey down the mountains, the river flows southwestward to a point in the foothills near Friant, where it is impounded to form Millerton Lake.

At this point a major portion of the water is diverted into the Friant-Kern and Madera Canals. Of the average 1,500,000 acre-feet delivered annually by the two canals, the Madera Canal carries approximately 500,000 acre-feet or one third of the total. The remainder, after diversion into the Madera and Friant-Kern Canals, is released into the river below Millerton Lake for use between the dam and Mendota Pool. Near Mendota Pool, the river turns and travels in a northerly direction where it eventually joins with the Sacramento River east of Suisun Bay. The Kings River, by way of the Fresno Slough, is the only major tributary that enters the San Joaquin from the south; the remainder, approximately eight major streams and 22 minor ones, flow into it primarily from the north and east.

The entire San Joaquin River basin is 290 miles long and 130 miles wide and embraces 32,000 square miles (all tributaries such as the Fresno and Chowchilla Rivers included). The rim of the basin is formed by the crest of the Sierra Nevada at the east, the Tehachapi Range at the south, and the Coast Range at the west.

The precipitation varies greatly both geographically and seasonally. It ranges in seasonal average from 50 inches in the mountains to less than 10 inches on the valley floor. About 90% of the precipitation falls from November to April and most of it as snow. The annual runoff for the drainage area above Friant averages approximately 1,700,000 acre-feet per year.

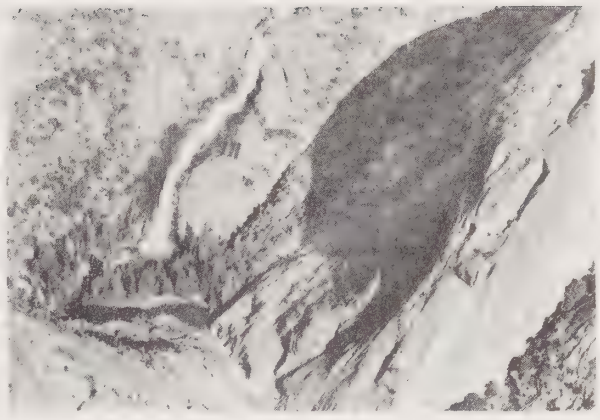


Fig. 39. The Middle Fork of the San Joaquin River is joined by cascading Granite Creek a few miles above the junction of the South and Middle Forks of the River

SURFACE WATER QUALITY

Much information has been compiled regarding the quality of both surface and ground water in the study area. An evaluation of available data on quality of both ground and surface waters in Madera County has indicated that existing water supplies are well suited for most beneficial uses.

The electrical conductivity of water is easily determined and is an indicator of the mineral content of the water. For these reasons, electrical conductivity is often measured in samples of water for which quality information is desired. The following tabulation shows the average annual range of conductivity of water samples taken at 7 surface water quality sampling stations located in the study area during the period 1950 to 1960. The values shown were derived by simply taking the arithmetic average of the annual maximum and minimum conductivity of water for the seven sampling stations for varying periods during 1950-1960 and represent specific conductance in michromhos at 25° C.

TABLE 12

AVERAGE ANNUAL RANGE OF CONDUCTIVITY
(Micromhos at 25° C.)

Sampling Station	Conductivity Maximum	Minimum	Agency
San Joaquin River at Friant	88	34	DWR[1]
San Joaquin River at Biola	168	45	USGS[2]
San Joaquin River at Whitehouse	135	52	USBR[3]
San Joaquin River near Mendota	868	106	DWR
San Joaquin River near Dos Palos	732	139	DWR-USBR
Fresno River near Daulton	368	81	DWR
Chowchilla River at Buchanan Damsite	643	144	DWR

1 DWR: California Department of Water Resources
2 USGS: United States Geological Survey
3 USBR: United States Bureau of Reclamation

Madera County is divided into four principal drainage basins: Chowchilla, Fresno, San Joaquin, and upper Merced Rivers. The waters from the four drainage basins originate in a basically granitic terrain interspersed with areas of metamorphic rock and some minor areas of Tertiary continental deposits. The type of rock over which the water flows determines to a large extent the quality of the water.

Chowchilla River. Flows in the Chowchilla River on the valley floor usually terminate from about June to October of each year. During winter months and until the spring termination of flows, the character of the water is generally calcium-sodium bicarbonate-chloride. When fall runoff resumes, the water is generally sodium-calcium chloride. Occasional chloride concentrations in excess of the Class 1 (excellent to good) agricultural limit of 175 parts per million have been found in the river water at the department's surface water quality monitoring program sampling station near Buchanan Damsite. The water at this station has been consistently within the quality limits for drinking water and, with the exception of the above mentioned chloride concentrations, has been Class 1 for irrigation uses. The existence of somewhat higher concentrations of most constituents in this water than in the waters of the Fresno and San Joaquin Rivers is probably because a greater percentage of the flow tributary to the Chowchilla River originates in the areas of metamorphic rocks.

Two known springs on the headwaters of the Chowchilla River, which are in an area of metamorphic rock, are characteristic of much of the tributary flow to the river. An analysis of the water from one of the springs showed a sodium chloride type water containing 526 parts per million total dissolved solids, with calcium comprising 40 percent of the *cations* and bicarbonate comprising 29 percent of the *anions*. Although no analysis of the water from the other spring is available, the name "Salt Spring" implies that a highly mineralized spring exists in the watershed and contributes to the concentration of mineral constituents.

Fresno River. Natural runoff in the Fresno River varies from little or no flow in late summer months to flood flows during the rainy season. Past quality records show the water at the Department of Water Resourses, surface-water quality monitoring program station near Daulton to be sodium-calcium bicarbonate-chloride during the winter months and calcium-sodium bicarbonate during the summer months. The waters at this station are considerably lower in concentration of mineral constituents than the waters of the Chowchilla River and consistently have been within the recommended limits for domestic use and for for Class 1 irrigation water.

The lower concentrations of minerals in the Fresno River are probably the result of fewer and smaller areas of metamorphic rock in that watershed. Almost all of the tributaries to the Fresno Fresno River originate in a flow through granitic rocks and soils throughout most of their length.

San Joaquin River. Flows in the San Joaquin River are divided into three general classes or reaches. From the headwaters to Friant Dam the waters are representative of native Sierra watershed effluent. Between Friant Dam and Mendota Pool the water begins to show a considerable increase in mineral content. Below Mendota Pool the flow consists mostly of flows from Delta-Mendota Canal, another source of water.

Samples of San Joaquin River water have been collected for the department's surface-water quality monitoring program at the following stations: below Friant Dam, below Mendota Dam, and near Dos Palos. In addition, San Joaquin River water samples have been collected by the U. S. Bureau of Reclamation at Whitehouse and by the U. S. Geological Survey near Biola.

Water samples collected from the San Joaquin River below Friant Dam show the water to be calcium bicarbonate in character and of consistently good quality with low concentrations of mineral constituents. The water has met mineral quality requirements for domestic, irrigation, and most industrial uses.

Summer flow in the San Joaquin River below Mendota Pool consists of a mixture of irrigation return flows, ground water accretions, and Delta-Mendota Canal water. The quality of water in this reach is usually degraded by these flows to such a degree that it is Class 2 for irrigation and questionable for domestic use.

GROUND WATER

Ground water in the mountainous portion of the County is very spotty and varies from location to location. Solid bedrock in many places prevents the absorption of surface waters and carries practically all of the rainfall across its surface to local streams and then to the valley. With ground water in the mountains being so unpredictable, the text of this portion of the chapter will deal principally with the valley portion of the County.

However, meadows, gravel and silt filled stream courses, and major rock crevasses are generally good sources of *ground* water in the mountain region. Aquifers are severely modified by tilted and faulted rock formations. Short aquifers also creates short term springs or ground water supplies in some areas. Ground water supplies are very often "contaminated"* by nearby surface water infusions in rock areas. A wide range of artesian pressure is found in ground water supplies in the mountain area.

During the past several years the Madera area has depended upon ground water sources to supplement irrigation water obtained from surface supplies. During years of low rainfall, greater reliance is placed on the ground water reservoirs.

**Much surface water is currently potable in these mountain areas so contamination is not as dire a term as it is where greater human occupance contributes to surface water pollution.*

Beneath the valley floor, west of the foothill line (approximately the 500 foot contour elevation), occurs three distinct bodies of ground water. In downward succession they include (a) a body of unconfined and semiconfined fresh water occurring in alluvial deposits which overlie a widespread bed of diatomaceous clay known as Corcoran Clay; (b) a body of fresh water confined beneath the clay bed in alluvial and lake deposits; and (c) a body of saline *connate water** contained in marine sediments which underlies the fresh water body throughout the valley. Practically all of the wells pump from the upper ground water zone.

The ultimate source of the ground water in the San Joaquin Valley as a whole is precipitation on the valley floor and its tributary drainage basins. Replenishment of the confined and semiconfined ground water is by seepage from streams, by underflow in the permeable materials flooring the canyons bordering the valley, and by losses from irrigation in excess of plant growth requirements.

Infiltration of rain may be a significant source of recharge to the ground water when soil moisture is not deficient. It is an ironic fact that the annual rainfall is so low in the valley that soil moisture deficiency is perennial, and infiltration of rain is therefore usually not significant.

Infiltration from streams flowing across the valley is an important source of recharge to the ground water body, and before large-scale irrigation it was the principal source. Measurements of flow at various points along the streams entering the valley commonly indicate channel losses of many thousands of acre-feet of water. The intermittent streams that enter the valley lose some of their flow by evapotranspiration; but most of the water infiltrates, except in times of exceptional flood when surface flow is established all the way to the main drainage of the valley.

Despite efforts to avoid them, infiltration losses from irrigation canals and ditches and infiltration by excess irrigation water applied to cultivated lands contribute heavily to the ground water supply, more so than from stream channels. Where the soil and underlying material are relatively permeable, as on the low plains surrounding Madera City, infiltration from canals may take up a substantial portion of the total supply of irrigation water. To satisfy irrigation demands in such areas, sufficient water must be diverted to offset canal losses and still leave enough water for farm delivery. The overall effect is that replenishment of ground water there is much greater than where the soil is impermeable.

There is little or no subsurface inflow to the ground water basin and the basin therefore is a reservoir that stores seepage from surface flows. In this light, the ground-water basin serves the same basic function normally associated with surface reservoirs; i.e., it stores streamflow during periods when water use is less than runoff for later use when the use-runoff relationship is reversed. In the case of the East Side Area, the ground water reservoir provides both short and long-term regulation to surface flows.

**Connate Water: Existing from earlier geologic history when the valley was covered by saline ocean water.*

On a short-term basis, winter and spring streamflows, which are usually greater than current needs, are temporarily stored in the underground reservoir until summer and fall months when the need for water far exceeds surface supplies. This type of operation is the basis for earlier statements in this chapter that substantially all the surface inflow to the area is presently being utilized and perhaps more as we shall see next.

The water problems of the area are caused by the long-term depletion of the gound water reservoir. The reason for this is that average annual use is far greater than the average annual supply. The net result has been a general lowering of ground water levels. To be sure, there is some recovery of water each year as a part of the winter and spring runoff goes into storage, but this recovery is only temporary.

With the dropping of the water table, depth to ground water becomes a major problem. As the water table declines, it eventually reaches the point where it is no longer economic to pump irrigation supplies. Map number 26 illustrates that at the present time, the depth to ground water varies from 5 to 150 feet with much of the pumping occurring from depths of 50 to 200 feet.

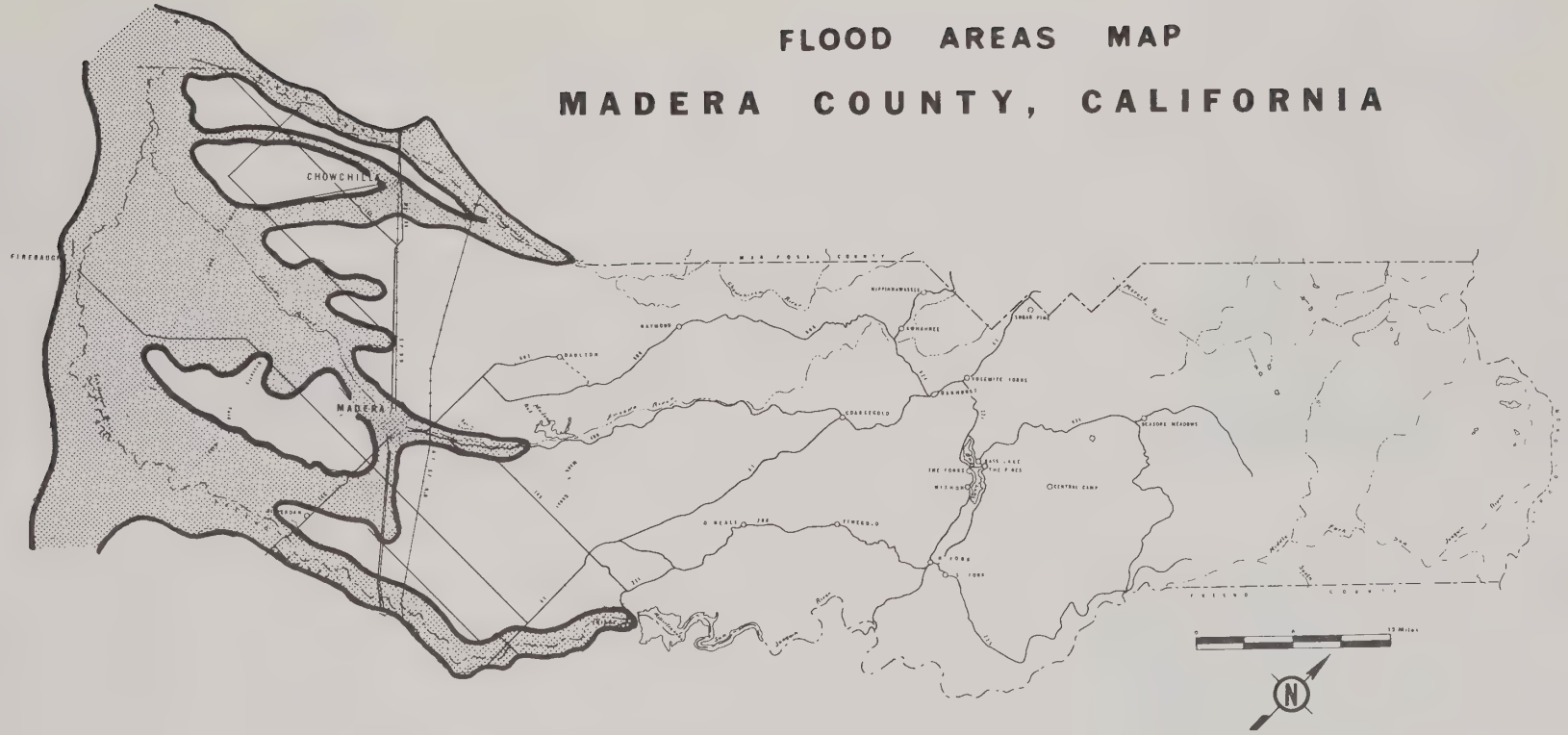
In the Madera area, water levels have declined about 40 feet since 1921 with present water levels standing at an average depth of about 75 feet. Maps numbered 25 and 26 illustrate the drop in the water table which has occurred during that four-year period, while Map 24 depicts the change occurring during a single year. This may not be indicative of a general trend, however, because the lowered water table may also be the result of below seasonal amounts of precipitation. New wells are being drilled to depths of 300 feet or more. Although ground water conditions have not yet completely stabilized, they are expected to do so when additional water is provided with the completion of the East Side Project.

At the present time another chief problem in the Madera County region lies in the new land areas being developed outside of the Major Irrigation Districts. Since these new lands are almost entirely dependent on ground water supplies, present overdraft conditions will continue. The water pumped outside of the major districts will affect the water levels beneath the districts because of the free flowing nature of the ground water reservoir.

There is also some cause for concern regarding the infiltration of saline water from the western end of the County. Ground water moves in response to the hydraulic gradient from areas of recharge to areas of discharge, and, under natural conditions, the unconfined and semiconfined ground water in the valley moved from recharge areas toward the topographically low trough of the valley where it was discharged at the land surface or was consumed by plants. However, the diversion of surface water from the streams and the development of ground water supplies for irrigation and domestic use has lowered the water level in some areas to a point where the hydraulic gradient has been changed and the movement of ground water reversed. If additional supplies of water from the forthcoming additions to the East Side Project do not raise the local water table and stabilize the gradient to its former flow, the Madera Area could find a major portion of its economy jeopardized by brackish, saline ground water intruding from the west.

FLOOD AREAS MAP

MADERA COUNTY, CALIFORNIA



Areas subject to overflow from various combinations of extraordinary floods

SOURCE– U.S. ARMY, CORPS. OF ENGINEERS (1 JANUARY 1945)

MAP 5

Fig. 18. San Joaquin River at Firebaugh Bridge crossing, showing lack of entrenchment

VALLEY - OVERFLOW LANDS - The overflow lands within the County are those areas in which the rivers spread out into numerous sloughs and which at times of highest flood under natural conditions have either been partly or wholly inundated. These lands are characterized on the geology map as Basin Deposits of Recent Time, consisting of unconsolidated fine silty and clayey sand, silt, and clay.

As mentioned earlier, the major rivers of the County have constructed natural levees on their banks along a major portion of their course through the valley. Along the San Joaquin River, these levees have been utilized in some places as foundations for man-made levees to control floods.

The overflow lands are very flat with low local relief and are generally poorly drained. The natural levees are the most prominent feature in the landscape and are a major influence in the direction of flow to both the trunk stream and the numerous tributaries. The Fresno River is a good example of a tributary whose course is influenced by natural levees along the San Joaquin River. On the west side of the County, natural levees along the San Joaquin River force the Fresno River to flow parallel to it for nearly 9 miles before allowing it to merge.

Fig. 19. Fresno River on right flowing parallel to the San Joaquin River on northwest side of Madera County

The soils of the overflow lands are quite heavy and poorly suited to intensive cultivation and as a result, most of these areas are used for the grazing of sheep and cattle.

Fig. 20. Basin deposit area in western part of County used for grazing

THE FOOTHILLS OR DISSECTED UPLANDS

The foothills or dissected uplands are made up principally of dissected old alluvial soils which have been cut through, over time, by the streams carrying runoff from the Sierra Nevada Mountains. These terraces now lie well above the flood plains of the present streams.

This area, with an altitude between 330 and 2,000 or 3,000 feet above sea level and occupying a position some 14 to 18 miles wide between the Sierra Nevada and the alluvial plains, has a rather diverse topography; it ranges from gently rolling to steeply sloping hills. The relief can be considered to be over 10 feet throughout the area. The gently rolling hills are found in the lower elevations while the more precipitous terrain is found higher up toward the Sierra Nevadas. In many areas, the smooth rolling landscape is broken by numerous outcrops of bedrock. The soils are commonly quite dense and compact, having zones of iron-silica-cemented hardpan, and with a hummocky or hog-wallow appearing surface. Grasses and oaks predominate in the foothills with some areas having a dense growth of brush. Efforts are continually being made by the ranchers in the area to clear the brush and provide more and better grazing land. Grazing is the major use made of the land along with some dry-farmed grain.

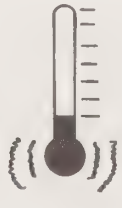
Fig. 21. Edge of foothills with hills capped by remnants of Ione Formation

The January mean daily minimum temperature (Map 8) is a few degrees above freezing at most observing stations below 2500 ft. elevation. Readings average about 33° or 34° near the low point of the San Joaquin Valley, with a band of warmer temperatures extending along the east side of the Valley to an elevation of a few hundred feet. There are indications that certain areas within this warm zone are protected against frost on all but the coldest nights. This factor indicates the strong probability of a viable "citrus belt" at the eastern edge of the valley, but much more localized frost research is needed. Daily minimum January temperatures drop to between 28° and 30° at the 3,000 ft. level, although the limited temperature series available for Crane Valley Power House (3500') gives a warmer (32.4°) minimum for this month.

Temperatures have dropped at one time or another to as low as 10° to 20° above zero at the lowest elevations and to near zero at 3000 ft. Daily minimum temperatures decline rapidly toward higher elevations, with the South Entrance station at 5120 ft. showing a 24.1° January value. No temperature data for higher Sierra elevations is collected within the County, but comparable high stations in adjacent counties permit some picture of the radically different temperature regime at these levels. Huntington Lake at 7020 ft. shows an average January minimum of 19.1°, while that value for Helm Creek at 8200 ft. is 1.8°! It must be cautioned that minimums, and especially absolute minimums, may vary widely even over short distances, depending upon local exposure as well as upon elevation. While Bishop Creek, for example, is actually a bit higher (8390 ft.) than Helm Creek above, its January average minimum is 18.3°. An area subject to cold air settlement experiences much more frigid conditions than does a nearby point from which cold air tends to drain away. Map 9 shows the distribution of the lowest readings on record.

FREEZE DATES

The lack of climatic data collection points within the County is especially felt in attempting to map patterns of frost dates and length of growing season. These statistics are particularly useful in the agriculturally important Valley and edge of foothill area, but within that area only Madera and Friant stations offer frost data records. These frost dates are subject to wide variation from year to year, and from one exposure to another within short distances, but despite these limitations, an attempt is made in Maps 10 through15to show these patterns with the aid of data from adjacent counties.



The last date in spring on which a temperature of 28° or colder is reported occurs between February 1st and 15th at lower elevations. At Madera, the average date is February 13th. Some freeze data from adjacent counties substantiate the picture of favored warner pockets along the foothills for which the last 28° Spring temperature comes earlier than in the Valley proper. Friant, the only available station which might illustrate this in Madera County, however, shows a last 28° average of March 2nd. Thus, the existence and location of foothill "thermal belt" pockets, although likely, remains conjectural.

With this one probable exception, last 28° dates, and last 32° dates becomes progressively later with increasing elevations, averaging late June at colder points in the high Sierra Nevada. The equivalent date for a value of 32° is around March 1st to 15th for most low-elevation stations, increasing to near mid-summer at high elevations. Maps10and11depict these patterns.

The average date of the first freeze in the fall occurs at Madera in mid-November for the 32° temperature and early December for the 28° value. In the high Sierra Nevada, these temperatures are likely to occur during the month of July. These patterns are shown in maps12and13.

Thus, the 23° growing season* averages 250 to 275 days in the Valley, (260 days at Madera), perhaps increasing to 300 days along the edge of the foothills, and decreasing to less than a month at the higher elevations. The 28° growing season extends for about 290 days at the lowest elevations, again perhaps increasing to 315 or more days in an edge of foothill belt, and then drops to a month or less in the High Sierra.

PRECIPITATION

Precipitation increases with elevation through the western third of the County, with annual totals averaging less than 8 inches in the southern corner of the County and increasing to over 33 inches at North Fork Ranger Station (2665') In general, the western third of the County averages less than 16 inches of water per year, providing a dry, semi-arid climate at low elevations, while some higher stations (4000-10,000 ft) report over 40 inches of precipitation yearly. The patterns of annual precipitation throughout the County are illustrated in Map 16 .

In common with other areas of California, precipitation is concentrated in the winter, nearly 85% of the total being received in the six months period from October through March. Monthly totals will range from 1.5 inches in the Valley to 6.5 inches at the 2600 foot level and over 8 inches at some 7000 foot stations, (Clover Meadow) during the wettest month. Monthly and seasonal averages for each station are listed in Table 6 in the appendix. In the mountains a large proportion of the winter's precipitation falls as snow; normally this provides a source of stream flow well into the summer.

**measured in days between the median dates of the last freeze in Spring and the first freeze in Fall.*

INTRODUCTION

Madera County's climate is basically determined by its general geographic location and topographic configuration.

The County's Pacific coast location and its latitude bring its climate under the general circulation controls of the semi-permanent high and low pressure areas of the North Pacific Ocean. The seasonal change in the precipitation regime is controlled largely by the semi-permanent *Pacific High*. It is these pressure systems which bring about the prevailing westerly to northwesterly winds on the coast.

In winter, when the *High* is absent or located far to the south of its usual winter position, generous precipitation frequently occurs in connection with migratory storms from the strong, semi-permanent *Aleutian Low* which moves southward from its normal winter position in the Gulf of Alaska and overspreads a large area about 2,000 to 3,000 miles in diameter off the Pacific coast of the United States. In summer, when continents are much warmer than the ocean surfaces and generally overspread by low pressure, the mass of air concentrates over the cooler ocean water surfaces; and there is a considerable expansion of the *Pacific High* to cover an area occasionally exceeding 3,000 miles in diameter. This is accompanied by a weakening and a northward movement of the *Aleutian Low*. Under these conditions, which persist throughout the summer, a virtually rainless season occurs in California and most of the Pacific coast region, except for occasional weak migratory storms in the northern portion of the area and occasional scattered thunderstorms primarily in the mountains and the southeastern desert basins.

These general circulation controls result in sharply differing climates as determined by the change in topography between valley, foothill, and Sierra regions of the County. The nearly flat valley is able to extract very little moisture from the eastward-moving marine air masses, and the result is a hot, dry, semi-arid climate. The gradually rising foothills succeed in obtaining sufficiently increased precipitation from the same air masses to change the climate from semi-arid to so-called *Mediterranean* type.

The Sierra Nevada, lying parallel to the Pacific coast, form a gigantic barrier to the prevailing westerly winds which carry the Pacific air to the interior. The coast ranges to the west are too low to extract any moisture from the air currents except in a few instances during the rainy season. As these air currents are forced to ascend the slopes of the Sierra, where elevations are such that they lower the temperature of the air, condensation occurs, providing an abundant winter and spring water reserve in the form of snow and rain. The majority of the precipitation occurs on the western slopes, increasing from about 4,000 to 9,000 feet whereafter it gradually decreases with continuing altitude. Markedly lower average temperatures, and a series of cooler, moister climates result from the increasing altitude. Climatologists usually classify this area as *Undifferentiated Highland* climate.

There is an observed tendency particularly in the foothills for the southern sides of hills and mountains to be dryer and hotter as reflected in sparser vegetation pattern on the south. This is to be accounted for, in part at least, by the microclimatic factors of greater sunshine exposure and consequently greater evaporation.

TEMPERATURE

Between the valley and foothills on the one hand, and the middle and high mountains on the other, a wide range of temperatures exists within the County. The most important factor determining the several measures of average temperature is elevation, although too little data is available to attempt to state the general rate of temperature decline with increasing altitude. There are exceptions to this relationship resulting from localized topographic and exposure conditions.

There are indications that one such exceptional area along the edge of the western foothills constitutes a "thermal belt" or series of "thermal pockets" where winter minimums are warmer than in adjoining areas. Since cold air drains to low spots, the low western area of the valley extending to the San Joaquin River have minimum readings that are somewhat lower than slightly higher areas in the valley near the foothills where air drainage is better. This has encouraged attempts at sizeable citrus plantings such as those along the eastern part of Avenue 12.

The July mean daily maximum temperature, as shown in Map 6 , average in the upper 90^{o} over most of the western half of the county, and above 100^{o} in two narrow strips; one along the far west side and other an east side belt near the Sierra extending for a distance up the San Joaquin Canyon, and lesser streams. Extreme readings of 110^{o} or higher have been recorded at nearly all points below 2600 feet.

Elevations above 5000 ft., particularly in the northeastern area of the County have cooler summer temperatures. This is primarily inferred by interpolation from reliable data stations in adjacent counties. South entrance,Yosemite National Park, two miles northwest of the County line shows a July mean maximum of 84.8^{o}, but even here a high of 102^{o} has been recorded. Map 6 also indicates that southeastern Madera County experiences a deep eastward salient of warmer temperatures following the gorge of the San Joaquin River.

Annual totals vary considerably over the years, and this becomes a significant consideration in an area receiving so little moisture. Table 7 shows the percentage probabilites with which various annual precipitation totals might be expected. It will be seen for example, that at Madera, where the annual total averages just over 10 inches, there is a 25% probability that precipitation will total 7.5 inches or less, whereas there is only a 10% probability that it will total 6 inches or less.

The intensity of precipitation follows a pattern closely related to the annual total. At lower elevations, most of the moisture falls as steady rain in winter storms that cover broad areas, and only in the higher elevations are there likely to be summer thunderstorms of high intensity and limited areal extent. In the Valley, rainfall intensities of 0.35 inches in one hour, 0.70 inches in 6 hours, and 0.90 inches in 24 hours may be expected about once in two years. These rates of fall may increase to 0.90 inches in 1 hour, 1.75 inches in 6 hours, and 2.25 inches in 24 hours once in 100 years.

Intensities are much greater at high elevations of the Sierra Nevada. There the 2-year expected values are about 0.80 inch in 1 hour, 2.50 inches in 6 hours, and 5.00 inches in 24 hours, while the 100-year values are 2.00 inches in 1 hour, 6.25 inches in 6 hours, and 12.50 inches in 24 hours. Long-term precipitation values are usually associated with winter storms that cover the entire area, while the heavier short-term quantities are likely to be associated with summer thunderstorms, particularly in mountainous areas.

SNOWFALL

A map of seasonal snowfall totals is shown in Map17, and data by station appears in Table 8 in the appendix. It must be cautioned that these are approximations, based largely on representative stations in other counties, since only a few low elevation stations within the County collect seasonal snowfall data. Amounts at low elevations are very light--about one inch at elevations of 1,000 feet--increasing to about 250 inches annually above 8000 feet. At intermediate levels, where snow settles or melts at intervals during the winter, the accumulation on the ground is ordinarily not great.

At higher elevations, however, snow remains throughout the winter: accumulations of 70 to 80 inches and more have been reported. The limits of heavy snowfall can be placed around 9000 feet. That area above 9000 feet is also relatively dry because of the heavy extraction of moisture from the air at lower elevations, however, snow remains at these higher elevations much later in the year because of the longer duration of cold weather which retards melting. It is not uncommon to see the snow disappearing in the higher elevations as late as July or August and to have it return again in October. Typically, it is early May before the last snow melts at the 7000 foot level, whereas at Madera, on the Valley floor, it is a rare occurrence for the infrequent snow to last as long as 24 hours.

WIND

In open areas of the County the prevailing wind direction is from the northwest during the most of the year, although southwesterly winds are more common during November, December, and January. Wind direction in mountainous terrain is determined primarily by orographic characteristics and may come from almost any point of the compass. In general, there is a tendency for the air to move upslope during the day and to drain dowslope at night. Occasionally the area is visited by strong north winds that dry the soil and dessicate vegetation. These winds are usually of higher velocity and more gusty on the west side of the Valley than on the east and some crop damage may be anticipated. The strongest winds appear to blow from the same directions as the prevailing winds: from the southeast during the winter and from the northwest during the rest of the year. Wind speed averages are lowest in November, increasing to a maximum in June. Extreme wind speeds, on the other hand, are likely to be higher during winter storms than during the remainder of the year.

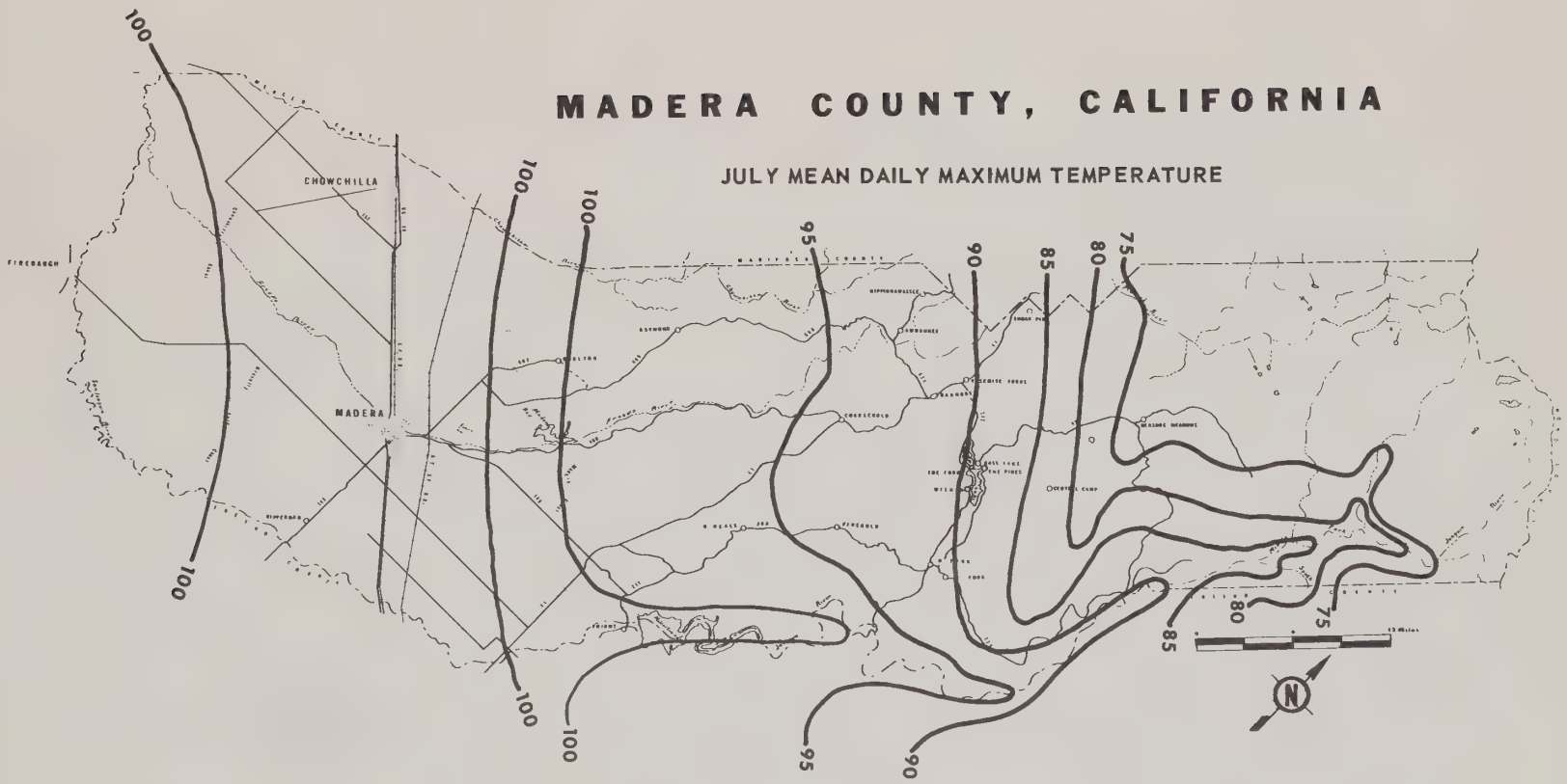
RELATIVE HUMIDITY

Relative humidity* is fairly high during the winter months, but low readings are the rule during the rest of the year. Late summer and fall are particularly dry in this part of California. Relative humidity during January ranges from about 50% to 70% during the day to 90% at night at low elevations and average from 85% to 95% in the mountains. There are usually some periods in winter when fog forming in the San Joaquin Valley persists for several days, occasionally lasting a week or more.

Moderate humidity values prevail during the spring and fall; night readings of 75% to 85% and day readings of 30% being common in the Valley, with 50% to 80% readings more likely in the mountains. Summer and early fall are likely to be very dry, afternoon readings frequently dropping below 15% in the valley and 25% to 35% in the mountains. Nightime values may be 60% to 80% at higher elevations.

Measurements are not available to determine the effect of irrigation on relative humidity readings. It seems likely, however, that in areas where regular irrigation is widespread, the average humidity value is probably increased by several percent. In turn, this would influence individual comfort and the evaporation rate. Demand for irrigation water and the effectiveness of evaporative coolers would also be affected by this condition.

**Relative humidity is the amount of moisture in the air compared to its total holding capacity at a given temperature.*



SOURCE– THE CLIMATE OF FRESNO COUNTY, FRESNO COUNTY PLANNING DEPARTMENT

MAP 6

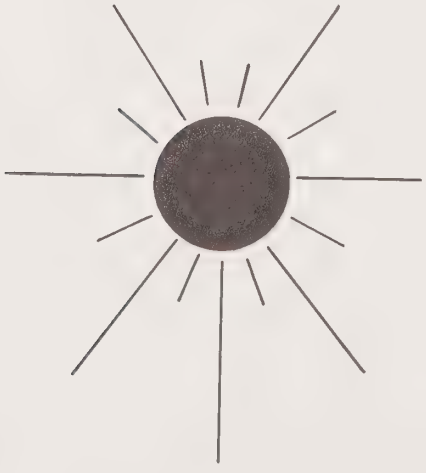
EVAPORATION

The total annual evaporation from a standard 4-foot pan ranges from about 110 inches in the western part of the Valley to about 50 inches at 7,500 feet in the Sierra Nevada. At Madera, this value is 73.69 inches. Approximately two-thirds of the annual total is lost from June through October. Losses during winter months are usually less than 2 inches in 30 days, but a typical summer month will show as much as 14 to 18 inches loss per month in the warmer parts of the area.

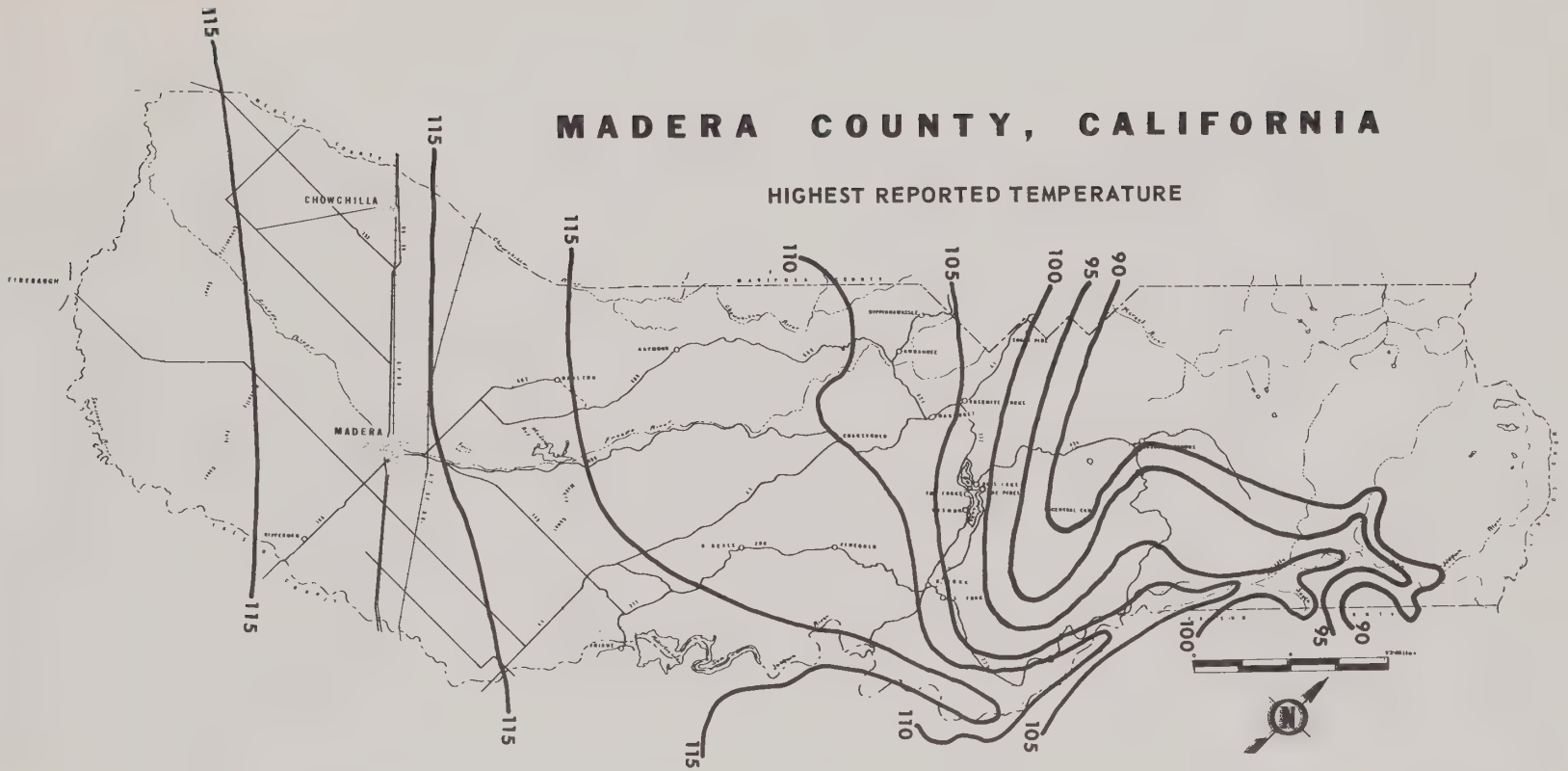
It is quite possible that the higher humidity associated with extensive irrigation would produce somewhat lower evaporation rates in those areas. Lake evaporation is assumed to be approximately 75% as great as Class A *pan evaporation.**

SUNSHINE

Abundant sunshine is characteristic of this area, the sun normally being visible for more than 95% of the time between sunrise and sunset during the summer months. The winter months show a value of about 50% of possible sunshine. However, during the rainy period of winter, there are likely to be a number of days of foggy weather, sometimes clearing before noon, but often persisting for several days without a break. Considerably more sunshine is experienced just above the fog or low clouds that frequently envelope the valley during winter. Cumulus clouds reduce the summer figure in the mountains, though sunshine is likely for a good part of the day even when such clouds are present.

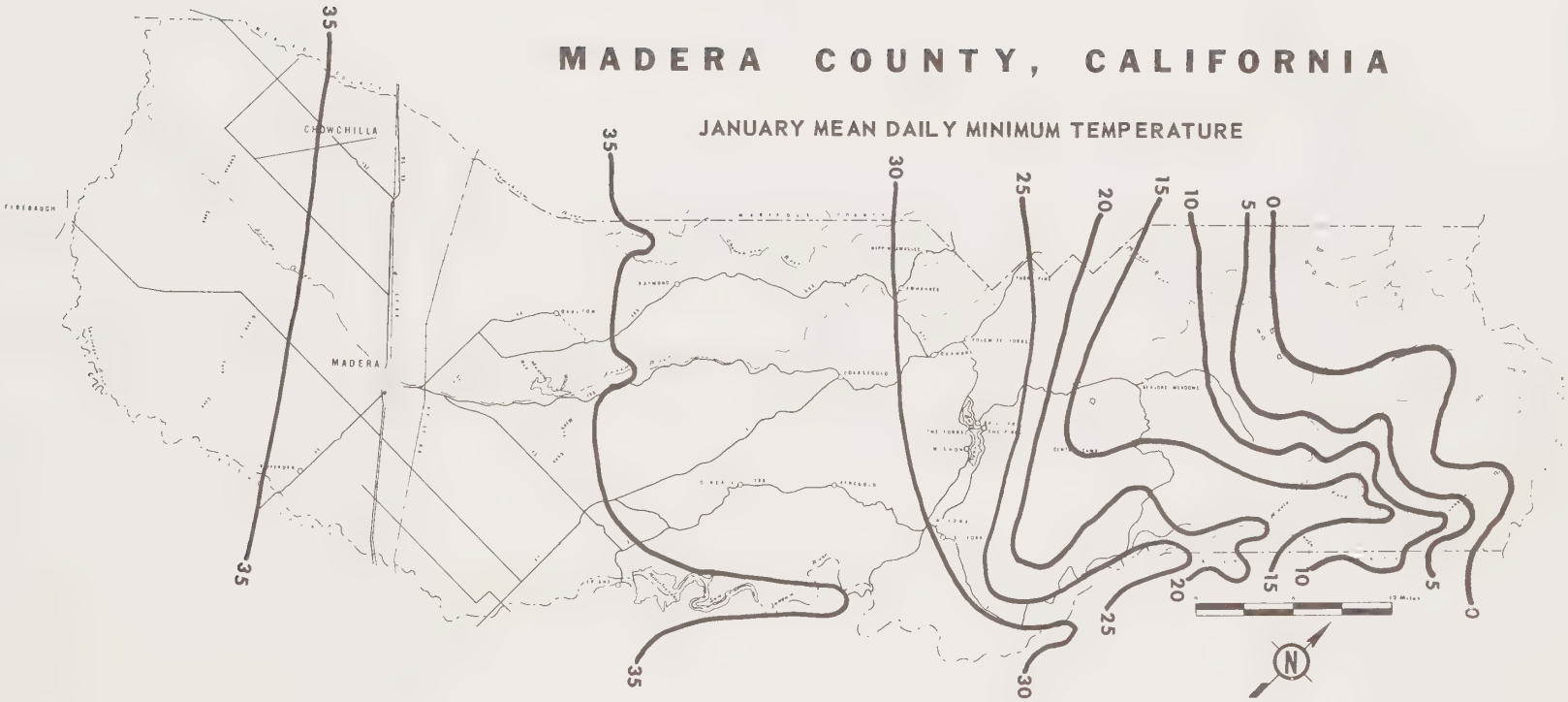


** A standard measuring device, indicating the rate at which moisture is evaporated from a small open water surface.*



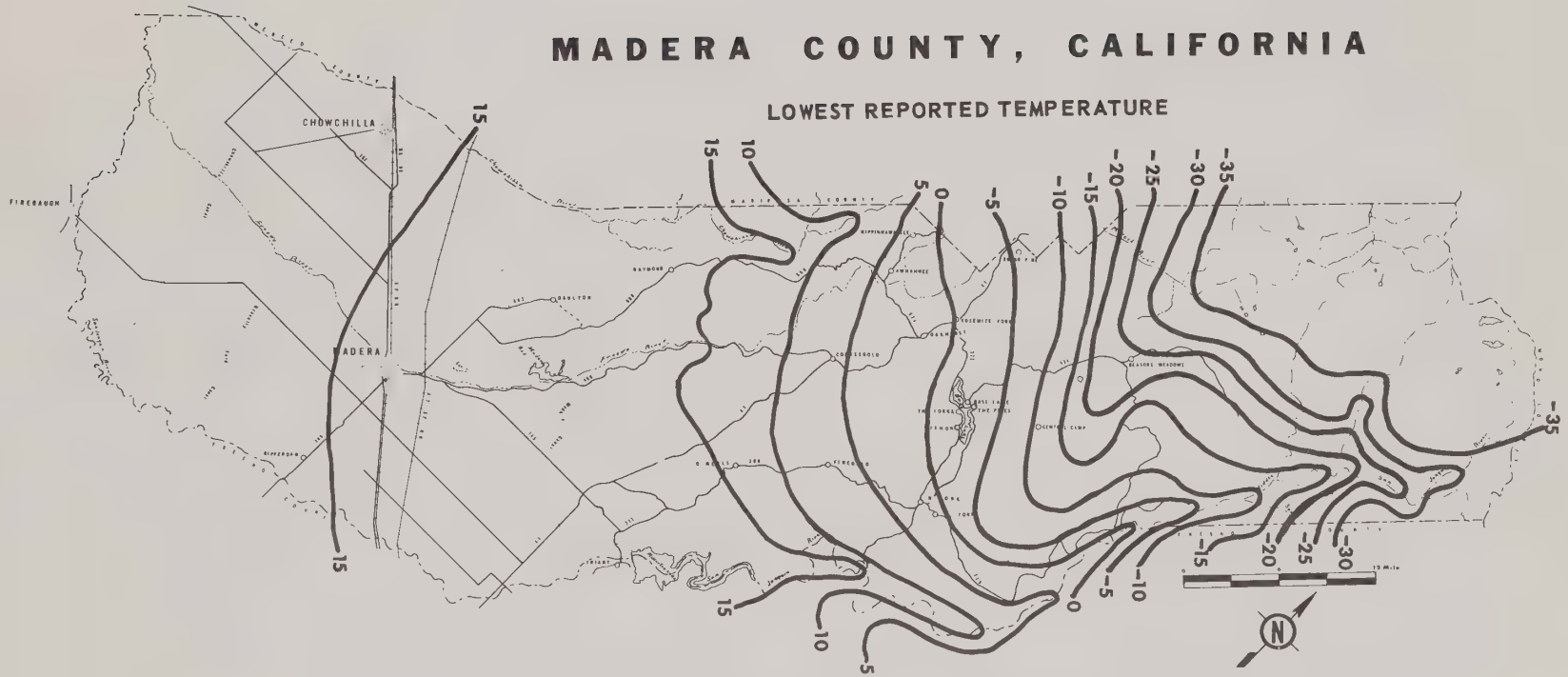
SOURCE– THE CLIMATE OF FRESNO COUNTY, FRESNO COUNTY PLANNING DEPARTMENT

MAP 7



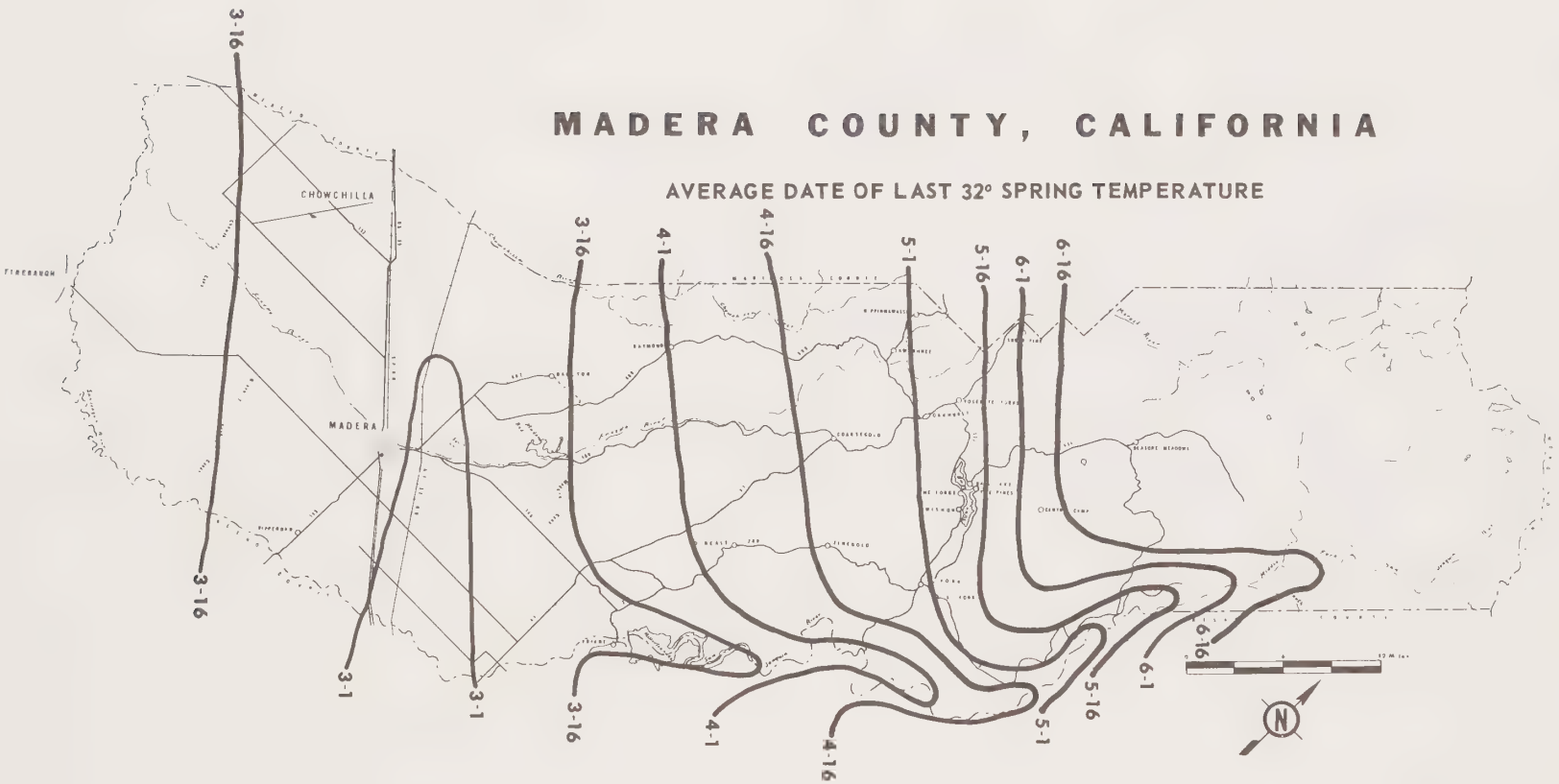
SOURCE- THE CLIMATE OF FRESNO COUNTY, FRESNO COUNTY PLANNING DEPARTMENT

MAP 8



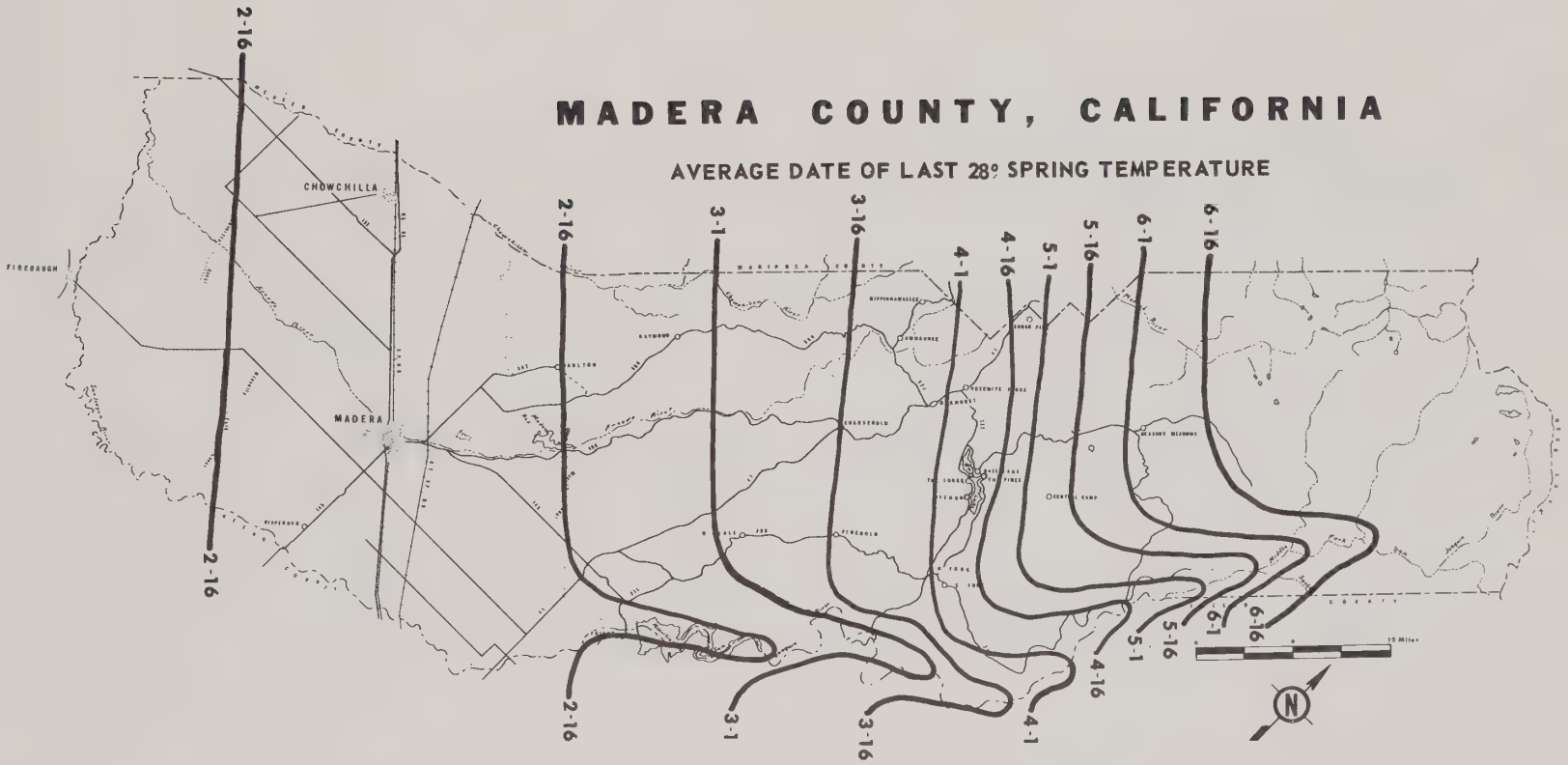
SOURCE– THE CLIMATE OF FRESNO COUNTY, FRESNO COUNTY PLANNING DEPARTMENT

MAP 9



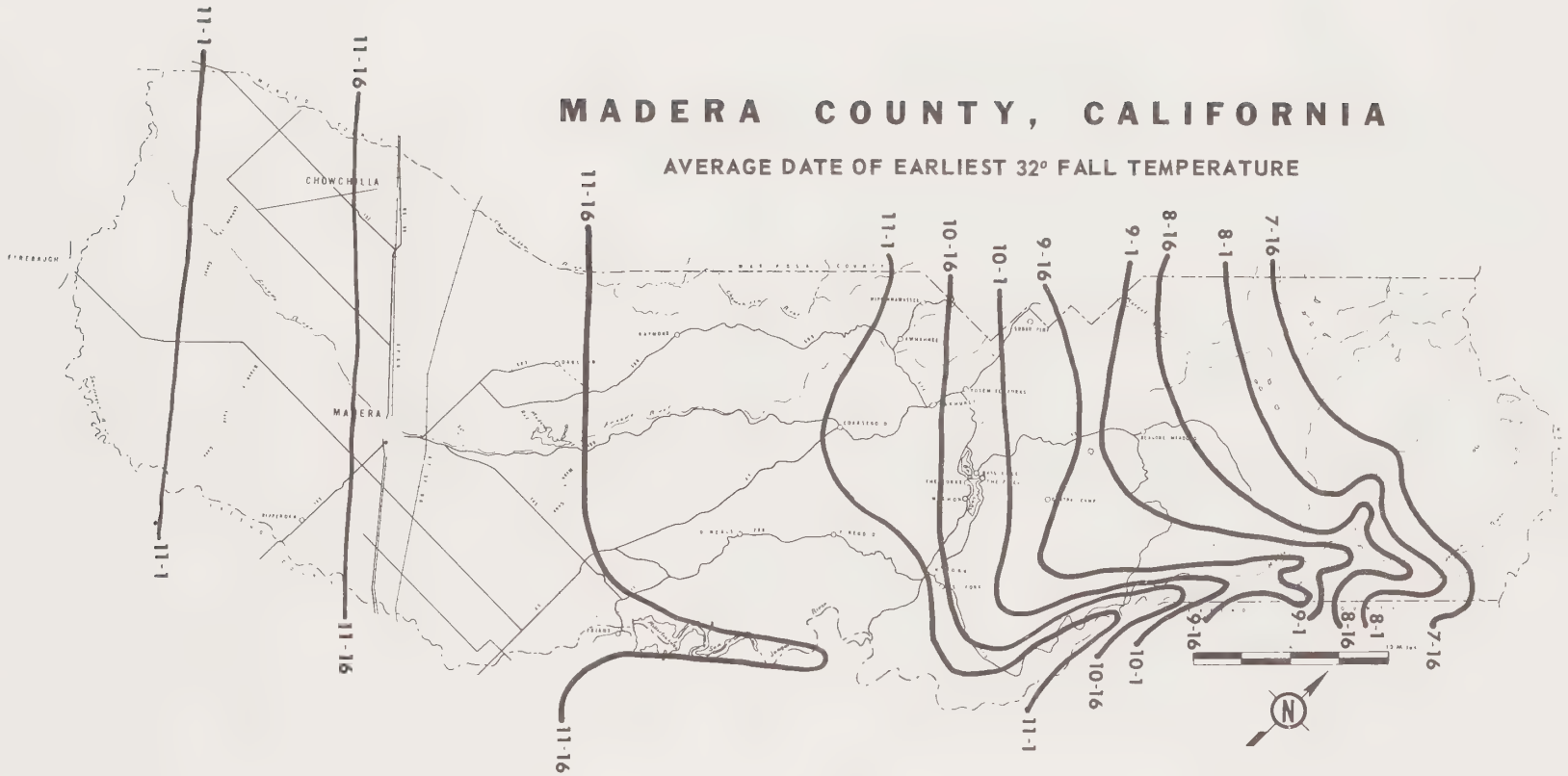
SOURCE– THE CLIMATE OF FRESNO COUNTY, FRESNO COUNTY PLANNING DEPARTMENT

MAP 10



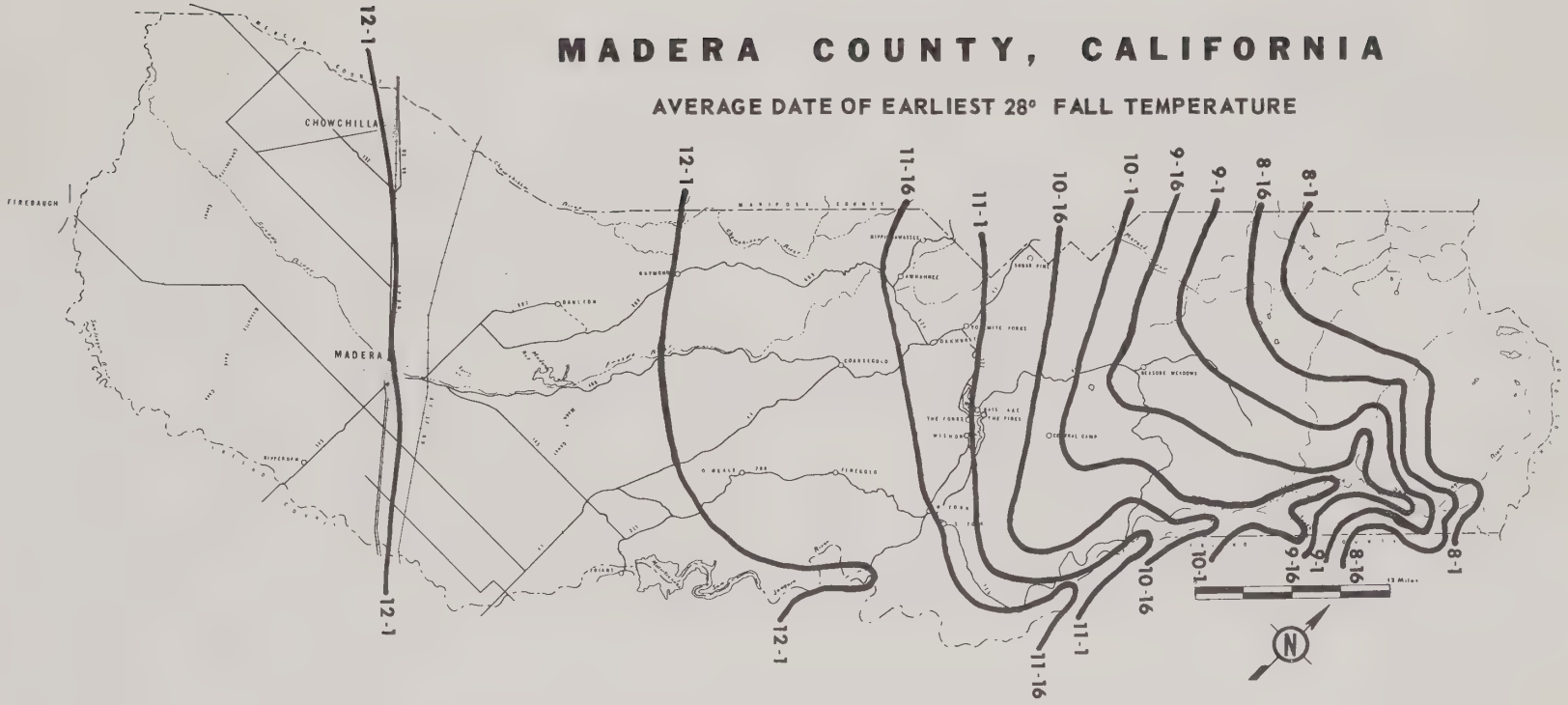
SOURCE– THE CLIMATE OF FRESNO COUNTY, FRESNO COUNTY PLANNING DEPARTMENT

MAP 11



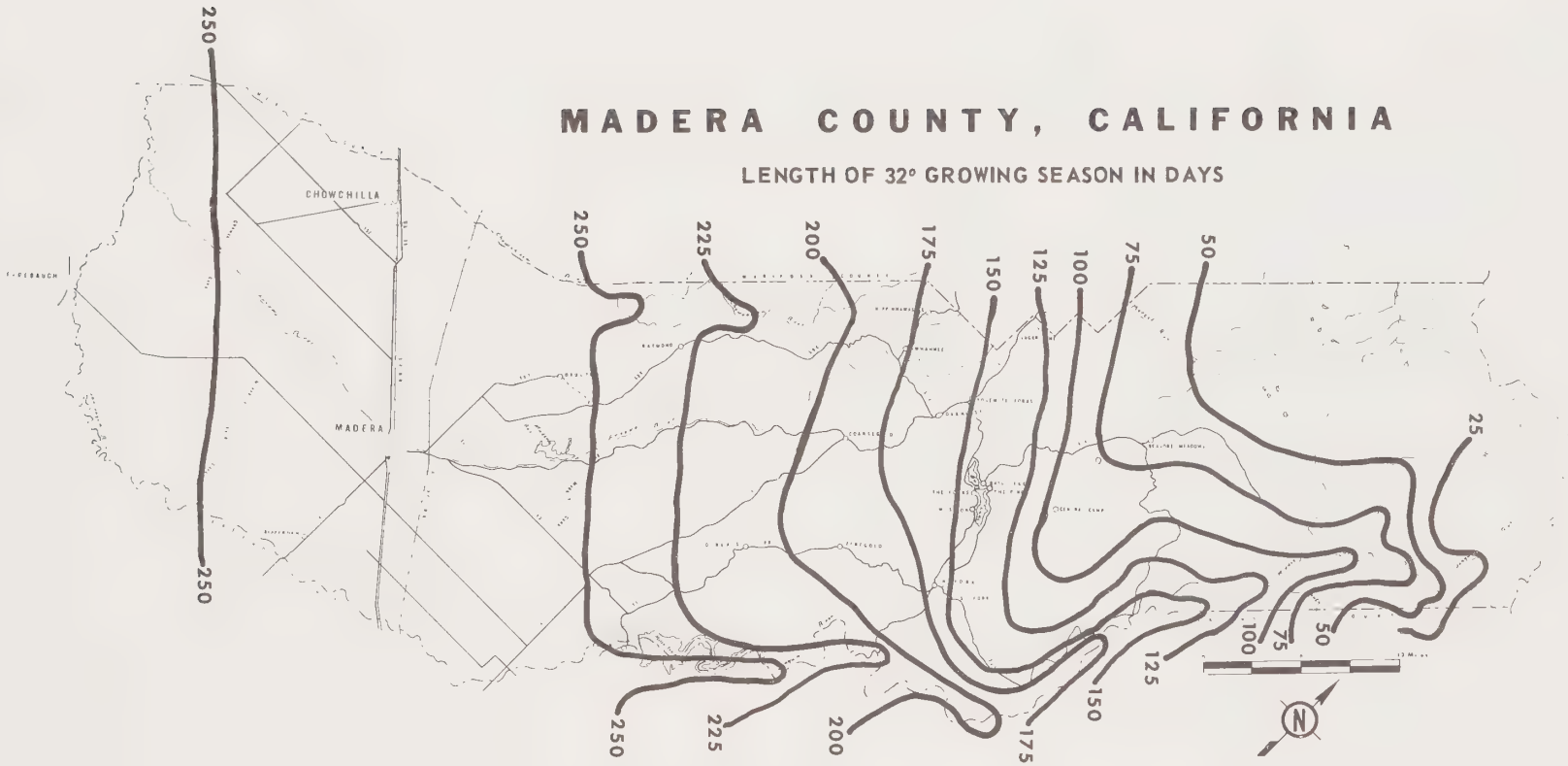
SOURCE– THE CLIMATE OF FRESNO COUNTY, FRESNO COUNTY PLANNING DEPARTMENT

MAP 12



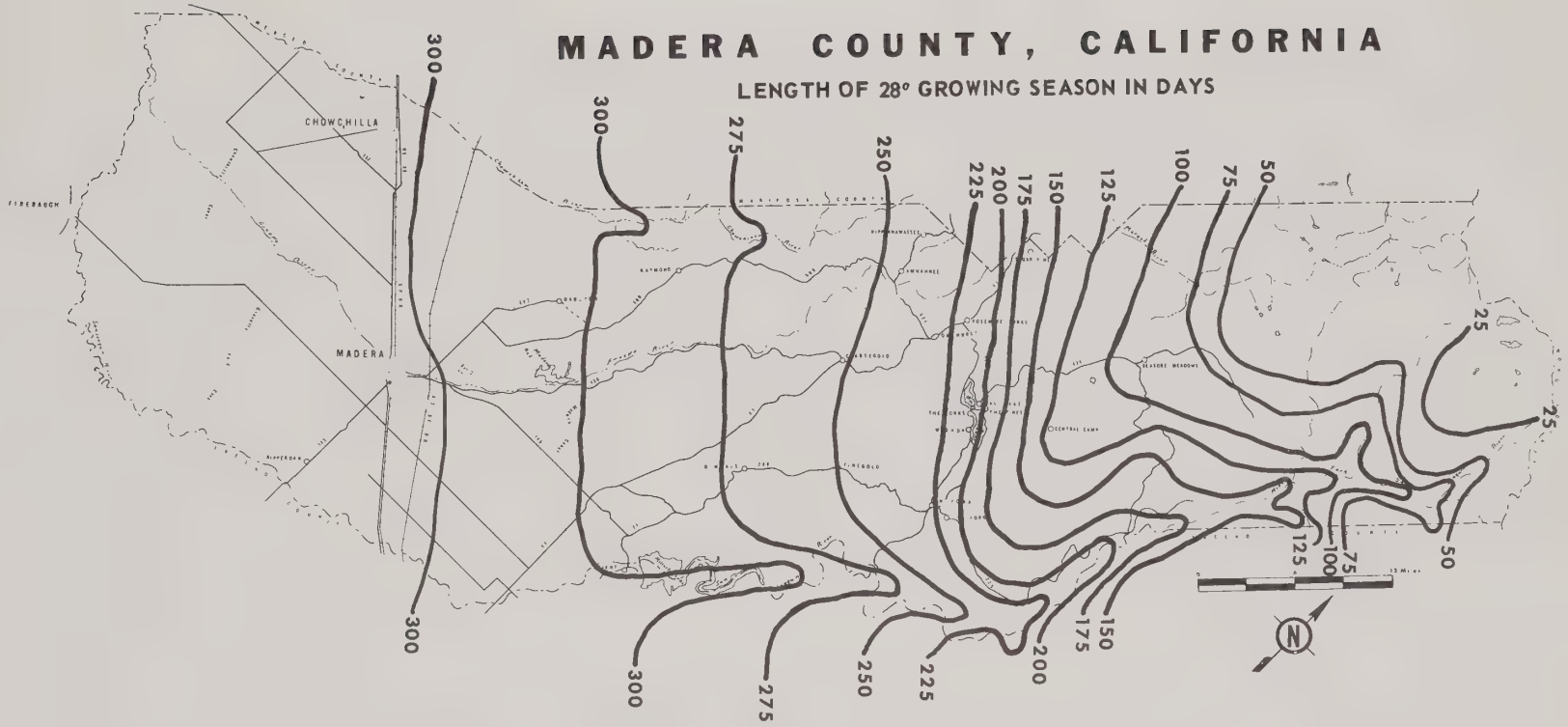
SOURCE– THE CLIMATE OF FRESNO COUNTY, FRESNO COUNTY PLANNING DEPARTMENT

MAP 13



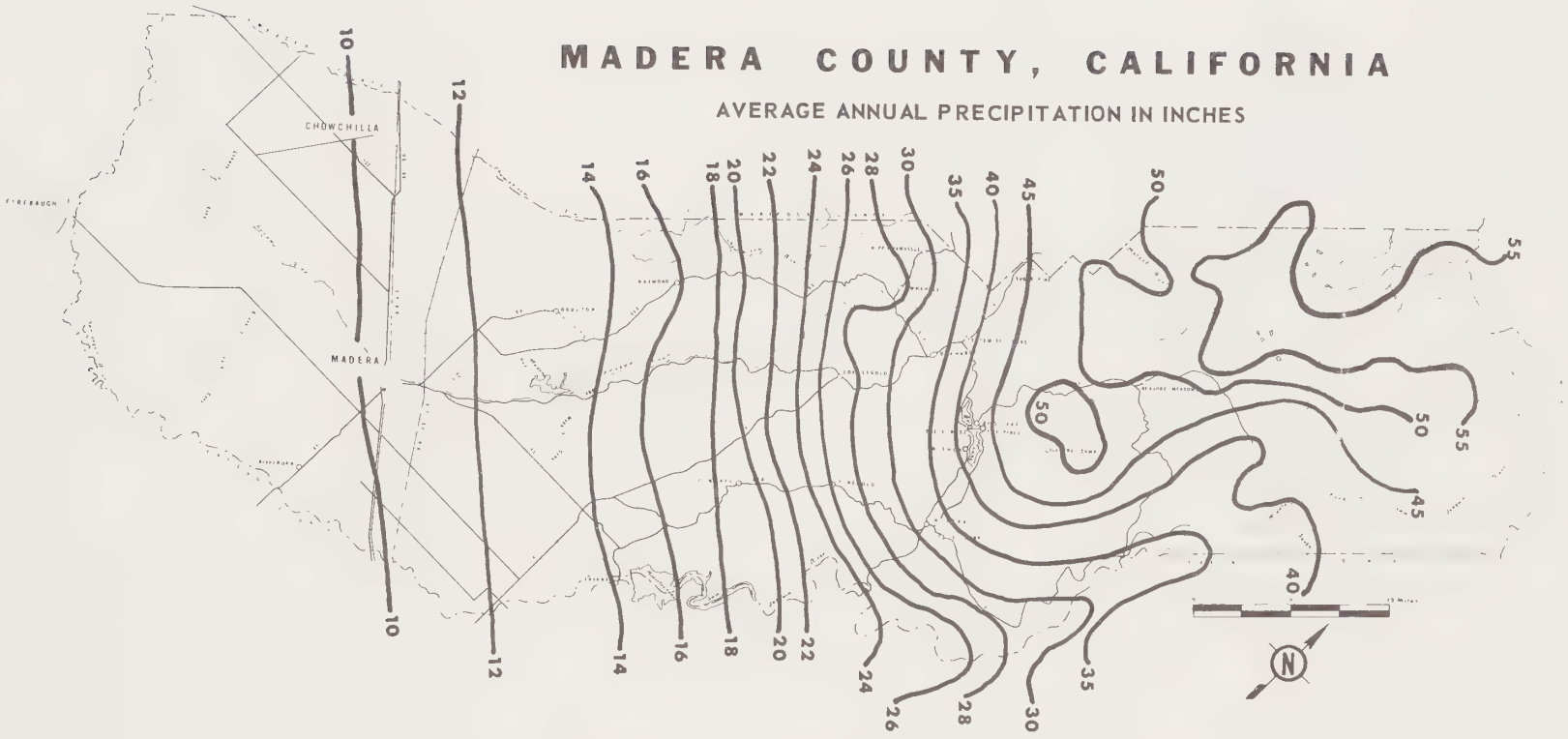
SOURCE– THE CLIMATE OF FRESNO COUNTY, FRESNO COUNTY PLANNING DEPARTMENT

MAP 14



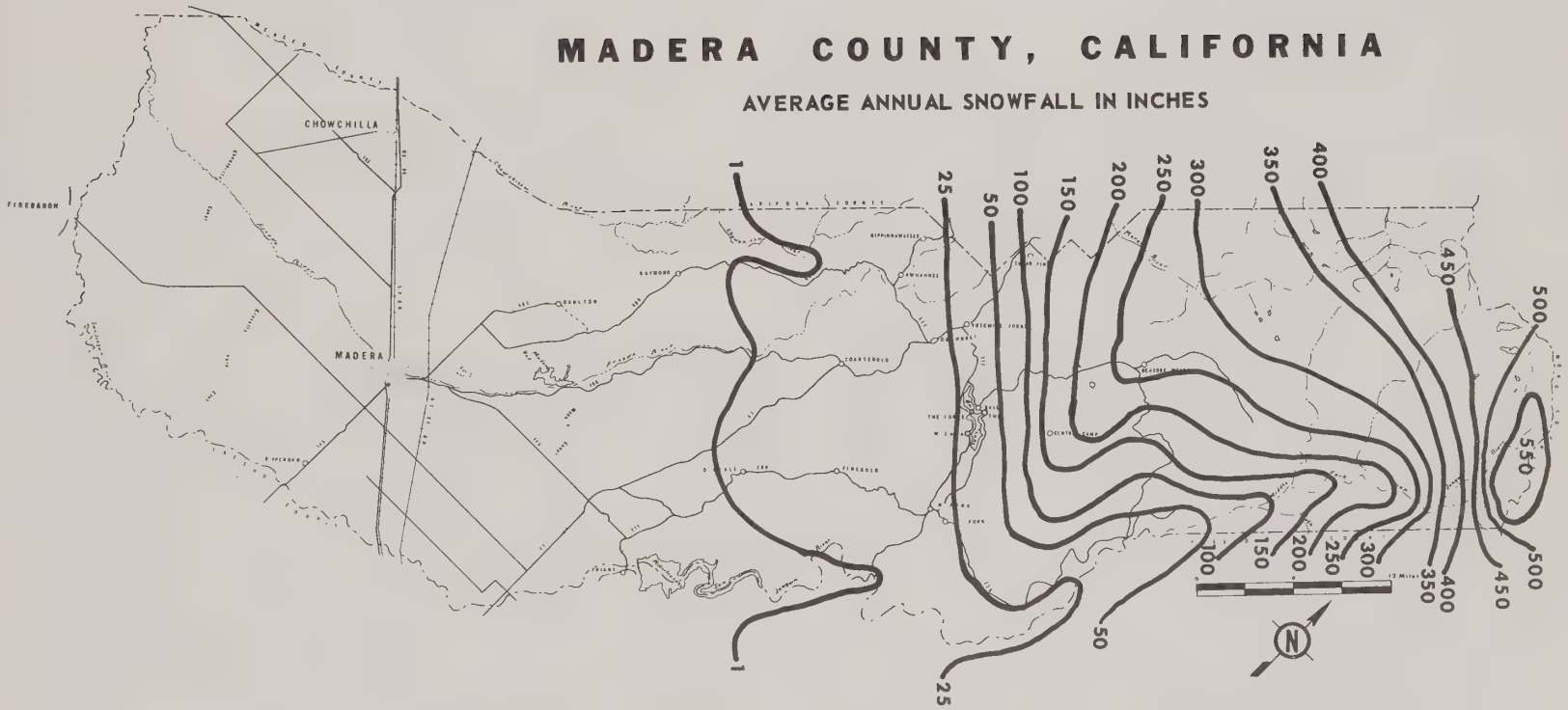
SOURCE– THE CLIMATE OF FRESNO COUNTY, FRESNO COUNTY PLANNING DEPARTMENT

MAP 15



SOURCE– THE CLIMATE OF FRESNO COUNTY, FRESNO COUNTY PLANNING DEPARTMENT

MAP 16



SOURCE– THE CLIMATE OF FRESNO COUNTY, FRESNO COUNTY PLANNING DEPARTMENT

MAP 17

VEGETATION

In viewing Madera County as it would have appeared during past geologic times we would find the elements of nature, particularly glaciers in the higher elevations, grinding down the mountains and converting solid rock into fertile soil. These glaciers were in effect preparing the way for the forests, meadows, and fields which we have today. In the early days (since the Pleistocene Period) the region now occupied by Madera County underwent a considerable change. Little in the way of vegetation existed, although it is probable that a conifer and fern forest existed on the sediments of the receding sea prior to the Pleistocene. The upper elevations were devoid of vegetation, while in the valley it was rather sparse and of a type more suited to cooler climates. With the retreat of the glaciers in the mountains to the slopes of the highest peaks, trees, shrubs, and flowers began to take their place.

The present vegetation of the County is believed to have been derived from at least three sources. One element, such as the Manzanita and Yerba Santa, had its origin in the California lowlands and gradually worked its way up through the foothills and warmer reaches of the County.

A second group of species is believed to have reached the area from the desert regions on the east. These plants had their origin in Mexico and slowly spread northward, finally crossing the Sierras through the passes to flourish in a few places on the western slopes. One of the more prominent of these species is the sagebrush.

The third group is the boreal or alpine. It is the generally accepted theory that during the glacial period when temperatures were lowered considerably, this species, native to the Arctic region, migrated southward. With the close of the glacial period, climatic conditions were reversed and the species survived in the north and to the higher elevations where conditions were more similar to those of their original northern home. It is not surprising, therefore, to find many of the cold weather plants of Madera County also occurring in Washington, Canada, and Alaska, but where they grow at a lower altitude. Some species are found in the polar regions around the world.

As seen from the foregoing, temperature is a major factor in the distribution of plant species. Among other environmental influences are soil, light, air, animals, and especially water. In order to better understand the reasons behind the distribution of the many natural plant species in the County it might be best to look at these factors and the influence they exert.

Moisture is one of the key factors affecting distribution. Where the subsoil is moist and the surface soil dry or only moderately moist as it is over the mountainous portion of the County, the result is a forest; with us it is mostly a coniferous forest. When the moisture is near the surface the result is a meadow comprised of plants which thrive in bright, wet areas. When a group of trees occurs in a meadow, it indicates that the moisture in that area is deeper in the soil.

Where the moisture content of the soil is quite small and insufficient for the growth of trees or a grassy meadow it quite often happens that a chaparral ecology results. Chaparral consists of several species of fairly low growing shrubs, usually with deep roots and with other characteristics which especially adapt them to dry areas.

Other plants worth mentioning are those found along the streams and riverbanks, commonly referred to as the riparian formation. These plants are extremely fond of damp places and will also be found around ponds and lakes. One of the most prominent species found in this category is the willow. Such plants as the willows often owe their character not only to an abundance of water, which is the most influential factor affecting the shape of plants, but also to the absence of excessive light. Leaves exposed to strong sunlight not infrequently assume a vertical position, thus presenting only a small surface to the direct rays of the sun. This is most evident in some of the manzanitas. Plants growing in the direct rays of the sun generally have very narrow leaves or specially protected leaves, thus guarding against excessive light.

The shade-loving plants, on the other hand, have an abundance of foliage, with broad, smooth, thin leaves that are spread out in such a manner as to receive the full benefit of the diffused light filtering down through the upper layers of the vegetation. Monkshood and columbine are good examples of such plants.

Rock-plants have exceptionally adverse conditions with which to contend. Aside from the great exposure to light, the soil from which they draw their nourishment is very shallow and is moistened only during the rains. Many of these plants have acquired thick, juicy leaves and stems and are capable of storing water in time of plenty to provide for their needs in time of drought.

We can well see from the foregoing how environment exerts a profound influence on the structure and appearance of plants. An understanding as to the prevailing conditions will generally provide an insight as to the types of plants that will be found in a particular locale. Plant and animal life alike vary with conditions of temperature, exposure, and rainfall. In a County such as Madera, there is a tremendous range in altitude which in turn affects temperature and rainfall, two of the most influential factors. Since each species inhabits only those places where conditions of temperature and moisture are suitable, the result is a grouping of plants into more or less definite belts of vegetation. These belts are known as *life zones*. To say that a certain animal or plant belongs in a certain life zone is to describe in a general way the factors it requires for growth and the type plants it associates with. One must not expect to find these zones always clearly defined. Quite often the line between the two belts is as sharp as though cut by a knife, then again the belts overlap and intermingle in a very confusing manner.

Trees of Madera County Classified by Life Zone

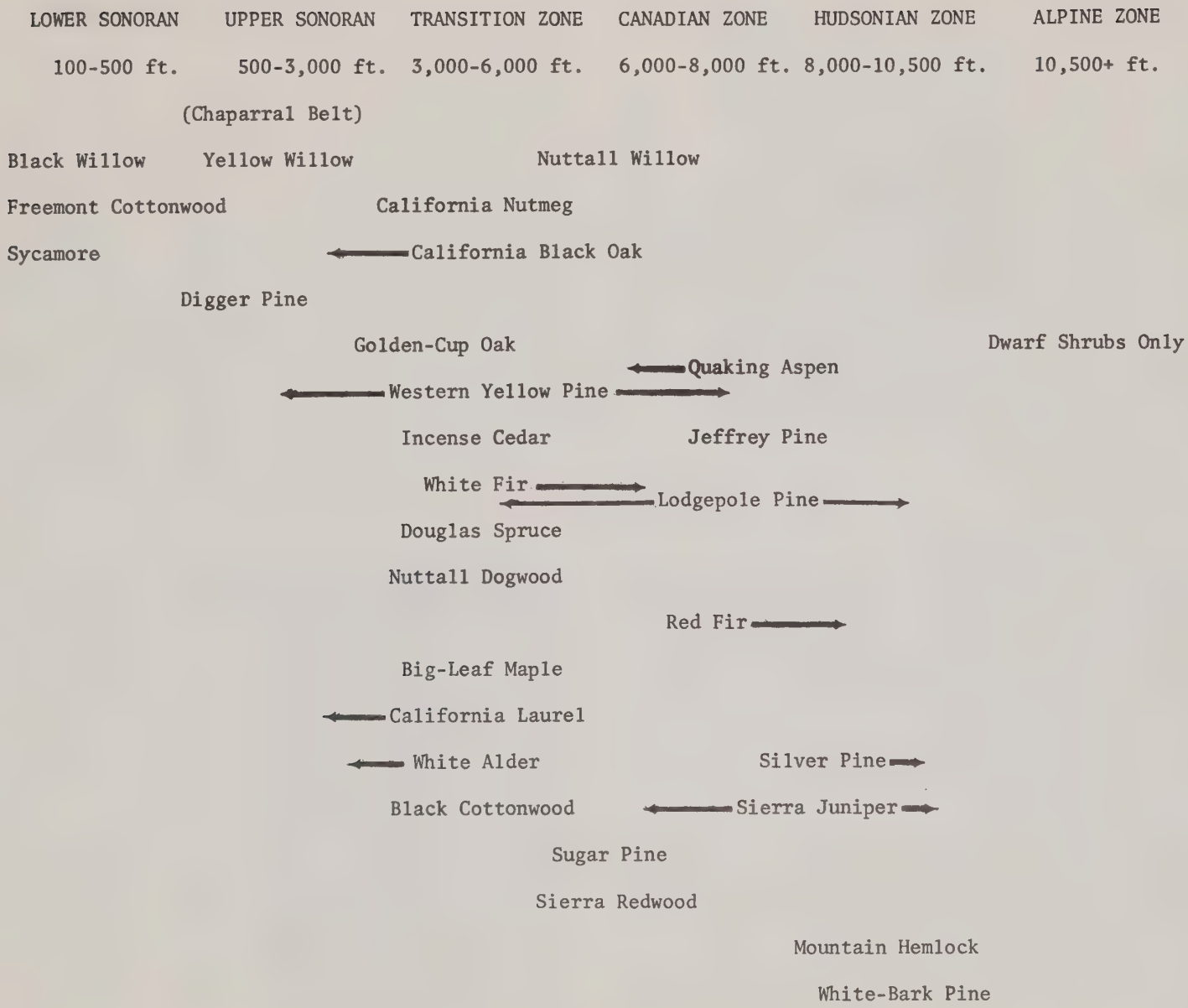


FIGURE 44

Figure 44 illustrates the distribution of the trees through the life zones of Madera County. The boundaries of altitude shown are only an approximation, of course, and not a hard and fast rule. The following are the life zones found within Madera County and the characteristic vegetative types found within each zone. It should be noted that a large portion, (in some cases half) of the species of a zone occur *only* in that zone.

THE LOWER SONORAN ZONE

The Lower Sonoran Zone comprises that area of the County below the foothills, varying in elevation from 100 to 500 feet. Except for the terraces and some alkaline areas, the major portion of this zone is presently being cultivated.

In its primitive state, the original vegetation was a dense growth of bunchgrass over most of the area. Man gradually changed the landscape until the bunchgrass gave way to annuals which germinate with the winter rains and flower in the spring. Trees in the area occur as narrow bands along the streams. Numerous trees and bright green lawns can now be found in all of the cities and scattered throughout the countryside surrounding homes and farmsteads. Extensive marshlands formerly lined the riverbottoms and overflow lands but have since been reclaimed by levees and are now being utilized for agricultural purposes, and in some instances are irrigated.

Fig. 43. A rare remnant of original vegetation complex along valley riverbank

Characteristic natural plants of the Lower Sonoran Zone include:

COMMON NAME	TECHNICAL NAME
ANNUALS	
Tomcat clover	Trifolium tridentatum
Owls clover	Orthocarpus erianthus
Three color gilia	Gilia tricolor
California poppy	Eschscholtzia californica
Saltbush	Atriplex cordulata
TREES	
Sycamore	Platanus racemosa
Freemont cottonwood	Populus fremonti
Black willow	Salix nigra

THE UPPER SONORAN ZONE

The Upper Sonoran Zone is a zone along the foothills, rather semiarid, being quite hot and dry in the summer but rainy in the winter. The major vegetative cover are shrubs, mostly with stiff branches, small, often thick, leathery leaves, and not rarely with spines. Annuals grow in abundance between the shrubs but only during the spring and early summer months. The root systems of plants in this zone are well developed and the herbage is often woolly, or densely hairy, or coated with resin. These are typical features of moisture-conserving plants of the semi-arid regions.

In actuality, the Upper Sonoran Zone in certain areas can be divided into two sub-areas, the lower foothill belt and the chaparral belt. These areas lie above the Lower Sonoran Zone at elevations from 500 to 3000 feet.

The lower foothill belt is a grass-land formation that turns brown in the summer months. Scattered oaks often occur among rock outcrops. The original cover of oaks on the foothills and stream valleys was far greater and more extensive than it is today. For more than a century they have been cut for firewood and, in some places, removed to increase the amount of range and pasture land. Young oak trees, sprouted from naturally planted acorns, are relished by livestock, so that oak woodlands that are heavily grazed contain few or no replacement trees. Some foothill areas now covered entirely by grassland, formerly supported an extensive stand of blue and live oak-

Characteristic plants of the Upper Sonoran Zone include:

COMMON NAME	TECHNICAL NAME
	HERBACEOUS
Plantian	Plantago erecta
Camphor weed	Trichostema lanceolatum
Wild onion	Alluim serratum
	SHRUBS
Buck-brush	Ceanothus cuneatus
Blue-blossom	Ceanothus divaricatus
White-leaf manzanita	Arctostaphylos viscida
California coffeeberry	Rhamus californica
Yerba Santa	Eriodictyon californicum
	TREES
Interior live oak	Quercus wislizenii
Blue oak	Quercus douglasii
Digger pine	Pinus sabiniana

The chaparral sub-zone is for the most part a firetype formation and shows evidences of having experienced fire for centuries and has become adapted to it. Even severe burns that consume leaves, branches, and trunks are not entirely fatal. Some species of chaparral plants produce abundant new shoots from root crowns, and the seeds of others germinate successfully only after a fire. The chaparral, therefore, tends to succeed itself as a type of cover. Certain kinds of soil covered by chaparral can be converted to grassland for grazing of livestock. Ranchers have cleared some areas by burning or chemical treatment and then seeded to grasses to yield forage.

Characteristic chaparral species are:

COMMON NAME	TECHNICAL NAME
Mariposa manzanita	Arctostaphylos mariposa
Parry manzanita	Arctostaphylos manzanita
Chamise	Adenostoma fasciculatum
Flannelbush	Fremontia californica
Christmas berry	Photinia arbutifolia
Poison oak	Rhus diversiloba

THE TRANSITION ZONE

About the 3000 foot level the vegetation becomes denser and finally develops into heavy forested areas. It is in this belt that we find *endemic** and southern species intermingling with those of northern origin. There is a strong intrusion of foothill species in the lower portions, particularly on warm hills and gravelly slopes. The Transition Zone, as this is called, also contains most of the commercial timber. This zone occupies a position just above the Upper Sanoran Zone between 3000 and 5000 feet elevation. It has a mean temperature of 55-60 degrees and an average rainfall of 25 to 35 inches. This life-zone is distinctive and rather definitely circumscribed. It contains a greater number of species of trees and shrubs than any other life-zone and has, in addition, a very large population of herbs.

Characteristic plants are:

COMMON NAME	TECHNICAL NAME
	HERBACEOUS
Rein orchid	Habenaria unalaschensis
Coral root	Corallorrhiza maculata
White-veined shin-leaf	Pirola picta
Wild aster	Aster integrifolius
	SHRUBS
Hazelnut	Corylus rostrata
Gooseberry	Ribes roezlii
Western service berry	Amelanchier alnifolia
Deer brush	Ceanothus integerrimus
Green manzanita	Arctostaphylos patula
	TREES
Ponderosa pine	Pinus ponderosa
Sugar pine	Pinus lambertiana
Incense cedar	Libocedrus decurrens
White fir	Abies concolor
Sierra redwood	Sequoia gigantea
Douglas fir	Pseudotsuga taxifolia
Black oak	Quercus kelloggii
Canyon live oak	Quercus chrysolopis
Flowering dogwood	Cornus nuttallii

**Endemic: Peculiar to a particular locality*

THE CANADIAN ZONE

The Canadian Zone is not a very well defined zone. As a separate zone it has only a shadowy or wavering existence. Its natural place is on the average between 5000 and 7000 feet where there is a mean annual temperature of 50 to 55 degrees and an average rainfall of 40 to 50 inches.

Characteristic plants are:

COMMON NAME	TECHNICAL NAME
HERBACEOUS	
Rosey monkey flower	Mimulus lewisii
Lousewort	Pedicularis semibarbata
SHRUBS	
Bitter cherry	Prunus emarginata
Pine-mat manzanita	Arctostophylos nevadensis
TREES	
Lodgepole pine	Pinus contorta
Jeffrey pine	Pinus jeffreyi
Red fir	Abies magnifica

THE HUDSONIAN ZONE

The Hudsonian Zone is the timber-line zone, and is fairly well fefined at its upper borders. It has an average altitude of 7000 to 9000 feet, and a mean annual rainfall of 30 to 50 inches with the mean annual temperature of 45 to 50 degrees. In this zone, only the hardiest species of trees can thrive. At the upper limits of this zone much of the vegetation, particularly the trees, is curiously storm-twisted, recumbent, and in some cases lying prostrate.

Characteristic plants of this zone are:

COMMON NAME	TECHNICAL NAME
HERBACEOUS	
Rush	Juncus drummondii
Buckwheat	Eriogonum pyrrolaefolium
Fireweed	Epilobium latifolium
Elephant snouts	Pedicularis attolens
SHRUBS	
Lemmon's willow	Salix lemmonii
Ocean spray	Holodiscus discolor
TREES	
Whitebark pine	Pinus albicaulis
Western white pine	Pinus monticola
Mountain hemlock	Tsuga mertensia
Western juniper	Juniperus occidentalis

THE BOREAL ZONE

The Boreal Zone is a true alpine zone and is sometimes called the Alpine-Arctic Zone. Its altitude range varies from 9000 on up to the mountain peaks, with a mean annual temperature of 40 to 45 degrees and an average rainfall of 60 to 70 inches. The mountain sides and peaks in this zone appear barren of vegetation, but actually even here there is a surprising wealth of small plants, many of which bear brightly colored flowers. All of the plants in this zone are herbaceous in character.

Characteristic plants include:

COMMON NAME	TECHNICAL NAME
Steers Head	Dicentra uniflora
Buttercup	Ranunculus eschscholtzii
Sierra Primrose	Primula suffrutescens
Groundsel	Senecio muirii
Catch-fly	Silene watsonii

Vegetation, no matter in which zone it is found, is one of the County's greatest resources. Vegetation conserves and regulates water flow essential for irrigation, power, aquatic life, and domestic use; it is also the protecting cover that controls erosion; it provides natural feed for grazing cattle; it serves as the natural home of wildlife; and, by becoming increasingly more important in the role of outdoor recreation, it promotes the health and wellbeing of the people.

WILDLIFE

One of the most valuable yet least considered natural resources of Madera County is its native and exotic wildlife. The wildlife is one of the main attractions to the County for hunters, fishermen, and naturalists.

Population growth is bringing about a rising interest in our forests and open space, along with an increasing demand for timber, water, and other natural resources, all of which pose a serious threat to our wildlife.

Fortunately, unlike minerals, wildlife is a renewable resource and subject to management by man. The basic needs of wildlife such as food, water, adequate cover, and protection from decimating factors can be controlled to a large degree through proper management of the land they live on.

Management is the key to maintaining a healthy, attractive population of wildlife. Game laws are one means of management presently used on a statewide basis and have been in effect for centuries with the main influence of present-day laws steming from England.*

Before the conquest of England by the Norman kings, landowners were privileged to pursue wildlife on their own holdings; afterward, William the Conqueror took over the forests as crown property. Hunting then became the pastime of the royalty, with all game the property of the sovereign. Offenders of the king's game laws were severely punished; sometimes they paid for their offense with an eye, a hand, or even their lives. The laws were liberalized in the Magna Charta, the Charta Foresta, and other agreements in the thirteenth century, after which a man would not lose his hands or his life for killing a deer, but could be fined and imprisoned.

The idea that game was the property of the Crown was transferred to the colonies in a form that made wildlife the property of the State. Consequently, the State of California acts in a sovereign capacity for all residents in exercising control over all game animals and fish in the State.

The game laws presently in force are designed to keep the numbers of wildlife at their optimum levels for public enjoyment, however, the success of the management hinges on cooperation between the State and the landowner.

Fortunately for wildlife, one of the major landowners in Madera County is the United States Government, represented by the Forest Service, which provides a carefully managed program of multiple use within the forests. That the management of our national forests, on a continuous production basis since the early years of the century, has materially aided wildlife, is indicated by the fact that one third of all big game animals in the country and a myriad of smaller animals and birds claim the national forests as their home. The main objectives of the Forest Service in regard to wildlife management are to build up the habitat, to increase wildlife populations in some areas, and to limit wildlife populations in proportion to the land's productive capacity.

A considerable portion of the wildlife habitat in the County is situated on private land where effective incentives for adopting practices beneficial to wildlife are often lacking. Although the State is responsible for the protection and restoration of wildlife, it depends essentially on ranchers, farmers, timber owners, and other landowners to provide the habitat to produce the wildlife. A habitat is needed that will carry the animals through the entire year (which, of course, will vary with the species) according to their food preferences, and their cover needs. If these requirements are not provided, the animals cannot respond to the protection given them by hunting seasons, bag limits, or other laws designed to perpetuate the breeding stock. The land management practices are, therefore, of direct importance to the animals. What is done to the land and its cover determines how much wildlife can be produced.

CROSS-SECTION OF MADERA COUNTY

Between the San Joaquin Valley Trough and the Sierra Nevada

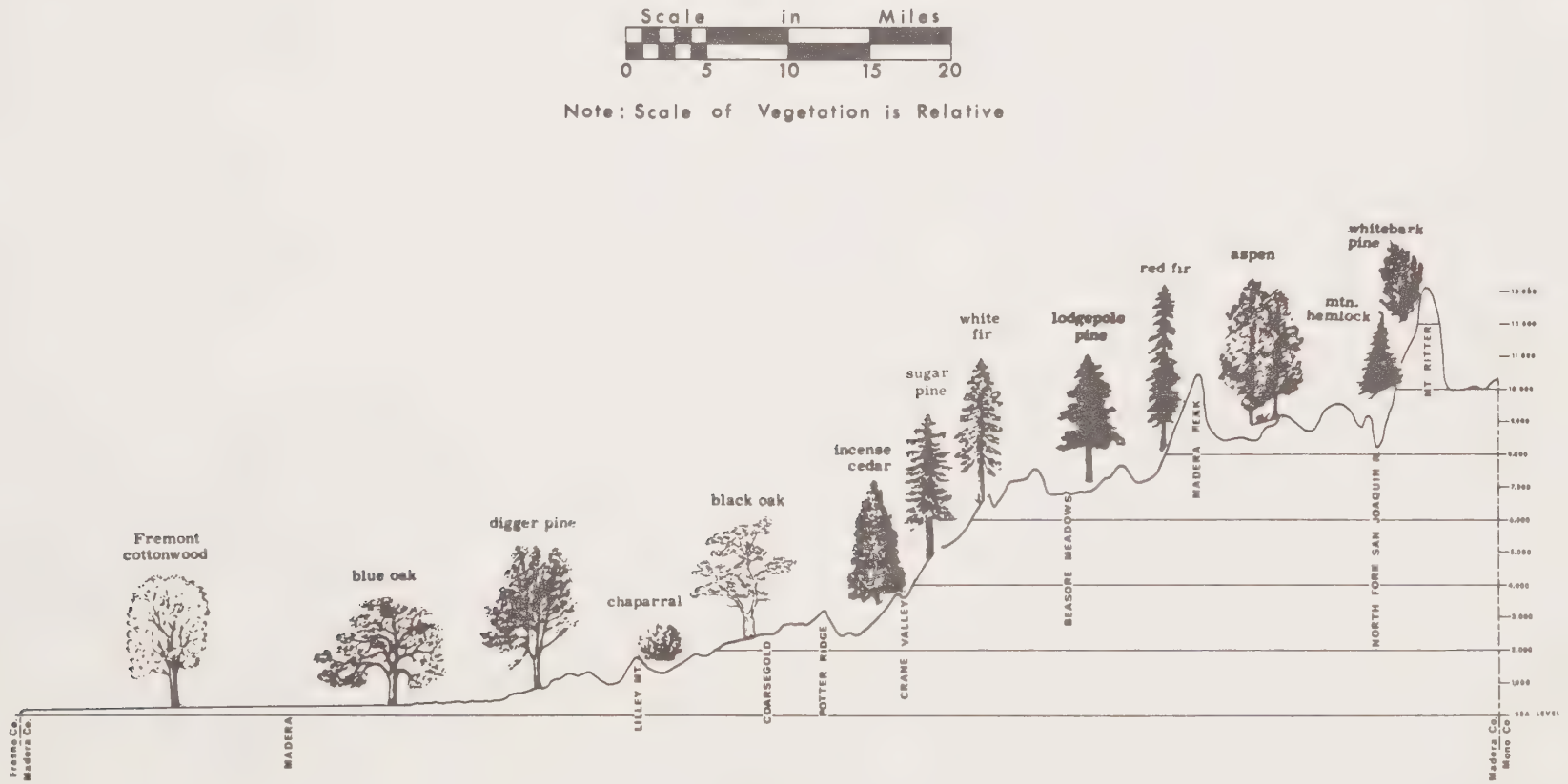


FIGURE 45

Due to the limited nature of this report, no mention is made of the numerous amphibians and reptiles which can be found throughout Madera County. However, it is felt that a few words should be included regarding the rattlesnake.

There are over a dozen distinct kinds of rattlesnakes which range over most of the United States but only the Pacific Rattlesnake (Crotalus confluentus oreganus) is found locally. It can be found over a variety of terrain, from the hot valley floor up to 8,000 foot elevations. However, they are more common in the foothill country than at higher levels.

They occasionally attain a length of five feet, but the average length is three to four feet. They live chiefly near rocks and brushy places but can also be found in relatively open country.

The temperament of the rattlesnake is generally quiet and slow, even lethargic, and he spends much of his time in warm, sunny spots, as on a rocky outcrop. Many use the cleared area along a trail as a sunning spot, which is reason enough to use extreme caution when hiking. When come upon, a rattlesnake will either remain quiet or endeavor to slither away. Only when the snake considers itself cornered is he likely to prepare for striking.

The danger from rattlesnakes is often exaggerated which is not to mean they are not dangerous. Due to the warning rattle generally given by the snake, very few people are actually bitten and of those who are bitten, only a very small percentage succumb, as in most cases prompt application of proper treatment counteracts the effect of the poison.

The diet of the rattlesnake consists chiefly of rodents and other small animals, and as such is quite beneficial to the farmer and rancher. Contact with humans is avoided whenever possible and at no time will a rattlesnake take the offensive and look to attack a human. They are as much a part of the wildlife scheme within the County as many of the more popular animals and as such, can be expected to be encountered from time to time. With a reasonable amount of caution, encounters with rattlesnakes can be as rewarding as with any other specie of wildlife in the County.

The wildlife of Madera County is of tremendous recreational value to residents and non-residents alike. Aside from the enjoyment received through hunting, fishing, or just viewing, large amounts of money are spent annually in pursuing such recreation, and this has a significant effect on the local economy. The wildlife in the County has a direct bearing on the sale of guns, ammunition, fishing equipment, outdoor clothing, field equipment, food, gasoline, trucks, campers, photographic supplies, and similar items.

In order to assure itself of the continuing rewards and benefits derived from its wildlife resources, a sound program of wildlife conservation must be established by both public and private interests within the County. There are three basic concepts upon which any sound program of wildlife conservation must be built. These are set forth by Gabrielson, former director of the United States Fish and Wildlife Service:

1. Soil, water, forest, and wildlife conservation are only parts of one inseparable program.

2. Wildlife must have an environment suited to its needs if it is to survive.

3. Any use that is made of any living resource must be limited to not more than the annual increase if the essential seed stock is to be continually available.

From these concepts, we see that an abundance or scarcity of wildlife resources is fundamentally interrelated with other patterns of land use. For this reason, wildlife management must be integrated with, and largely subordinate to, the management of land for agricultural, forest, and mineral use.

Prior to the arrival of permanent settlers in the San Joaquin Valley, wild animals roamed the valley and the mountains in vast numbers. Disease, Indians, and natural predators seemed to have little effect in depleting their numbers. With the coming of the settlers, however, many were pursued and driven to a point of almost total extinction. Some species are no longer found in the State or exist only in small numbers in remote areas.

Antelope and elk were quite numerous in the County at one time and were the favorite game sought by the early explorers. Today, the antelope is found in only two areas of the State while elk have been reintroduced to several small forested areas of the State. Neither of these animals are any longer found in the County. Mountain sheep were originally quite common among the high peaks of the County but they, too, have been eliminated. Even the grizzly bear, the golden bear of California, can no longer be found anywhere in the State, (the last one being killed in 1924), yet, during the early settlement of what is Now Madera County, it was an abundant big game animal.

We can only lament the loss of these species and make a concerted effort to preserve those which still remain for their high aesthetic value. Some species, however, are more plentiful today than at any other time. Included among these are the cottontail rabbit and the valley and mountain quail. These animals have benefitted by the clearing of the land for agriculture. Mule deer have also increased in considerable numbers, and in some areas are overpopulating their range. However, recent decisions to hold controlled brush burns by the County and the ranchers will result in increasing the carrying-capacity of the land to meet animal requirements instead of reducing the animal numbers to meet the carrying-capacity of the land.

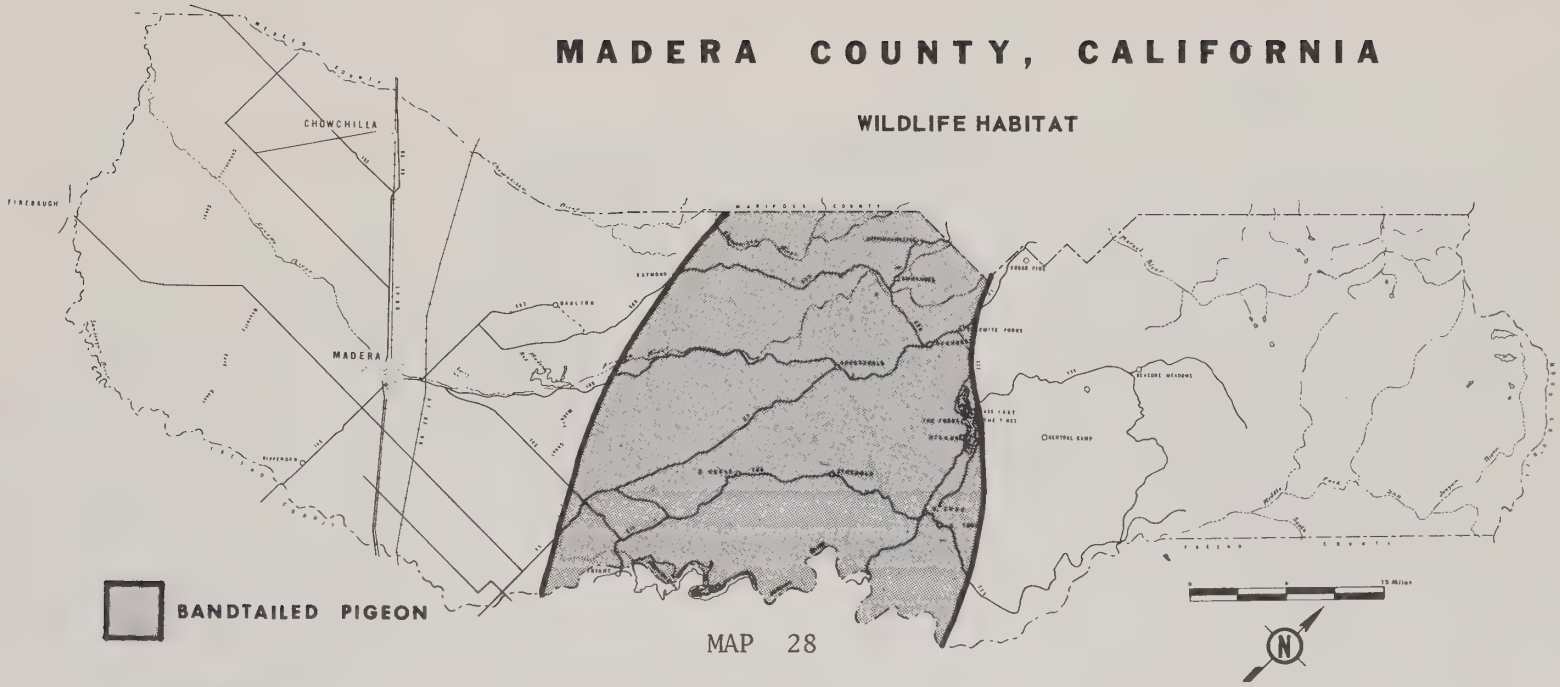
There have also been numerous attempts to introduce exotic animals to replace or substitute for the native animals displaced by mans occupancy of their environment. In most cases these attempts have been unsuccessful, however successful exception has been the introduction of the ringnecked pheasant. This bird has adapted itself to the valley environment and become a prize game bird among hunters in the County each fall.

Maps through illustrate the range of the more popular species found within the County. The following is a fuller listing of the most popular major species.

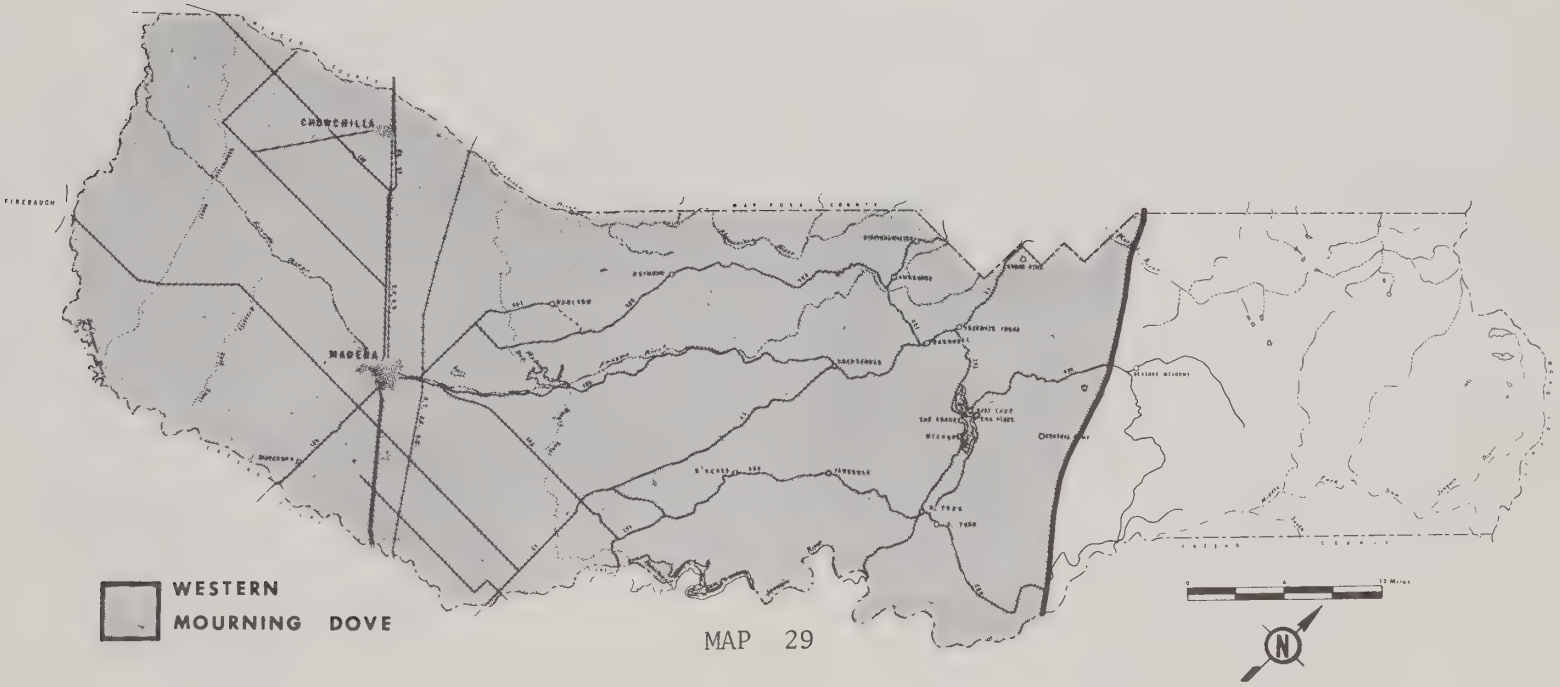
Cottontail Rabbit	Mountain Lion
Brush Rabbit	Mule Deer
Black Tailed Jackrabbit	Oppossum
California Ground Squirrel	California Quail
California Gray Squirrel	Mountain Quail
Chipmunk	Golden Eagle (bold)
Beaver	Canada Goose
Valley Coyote	Numerous Ducks
Mountain Coyote	Herons (Several Species)
Muskrat	Coot (American)
Porcupine	Hawks
Red Fox	Vulture
Gray Fox	Mourning Dove
Raccoon	Crow (Common)
Badger	Numerous Song Birds
Black Bear	Grouse (Blue)
Weasel	Band-Tailed Pigeon
Skunk	Owls
Wildcat	Ringnecked Pheasant

MADERA COUNTY, CALIFORNIA

WILDLIFE HABITAT



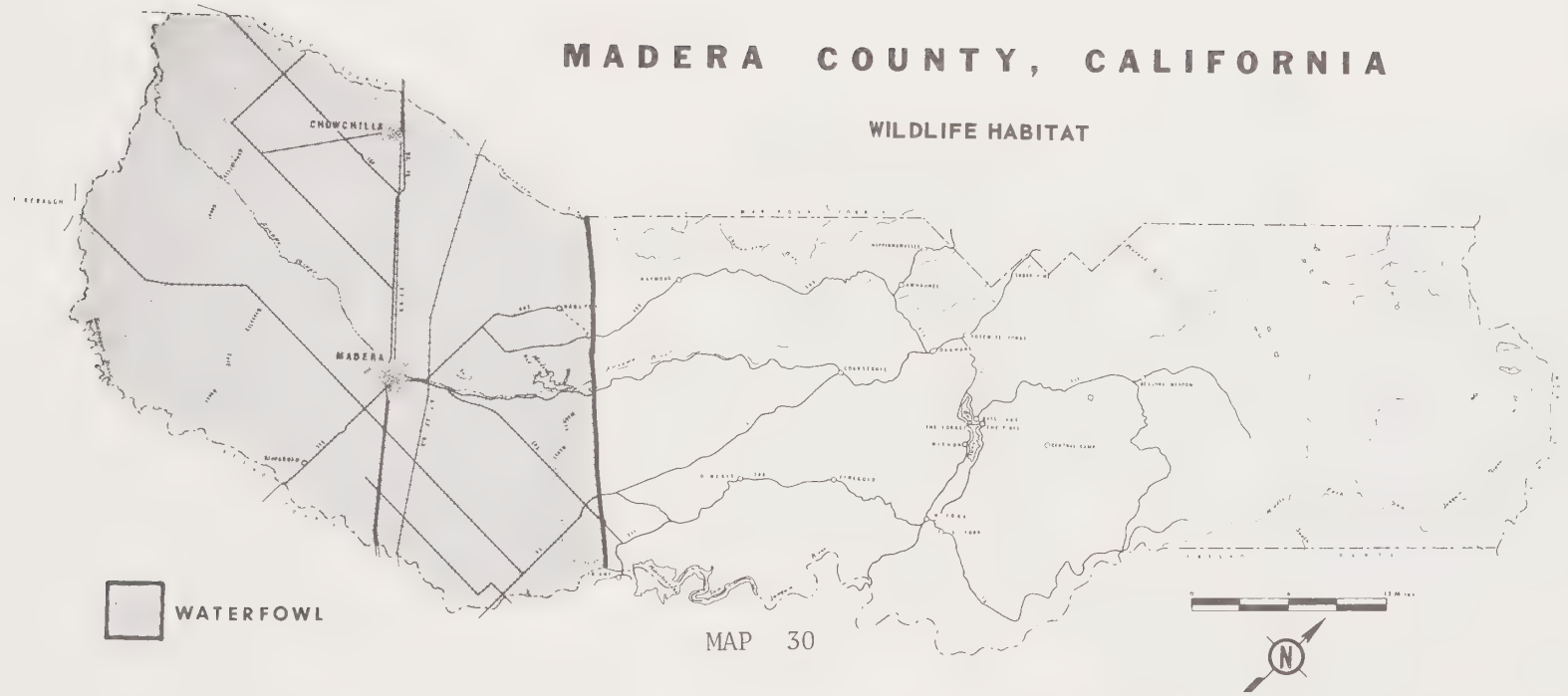
MAP 28



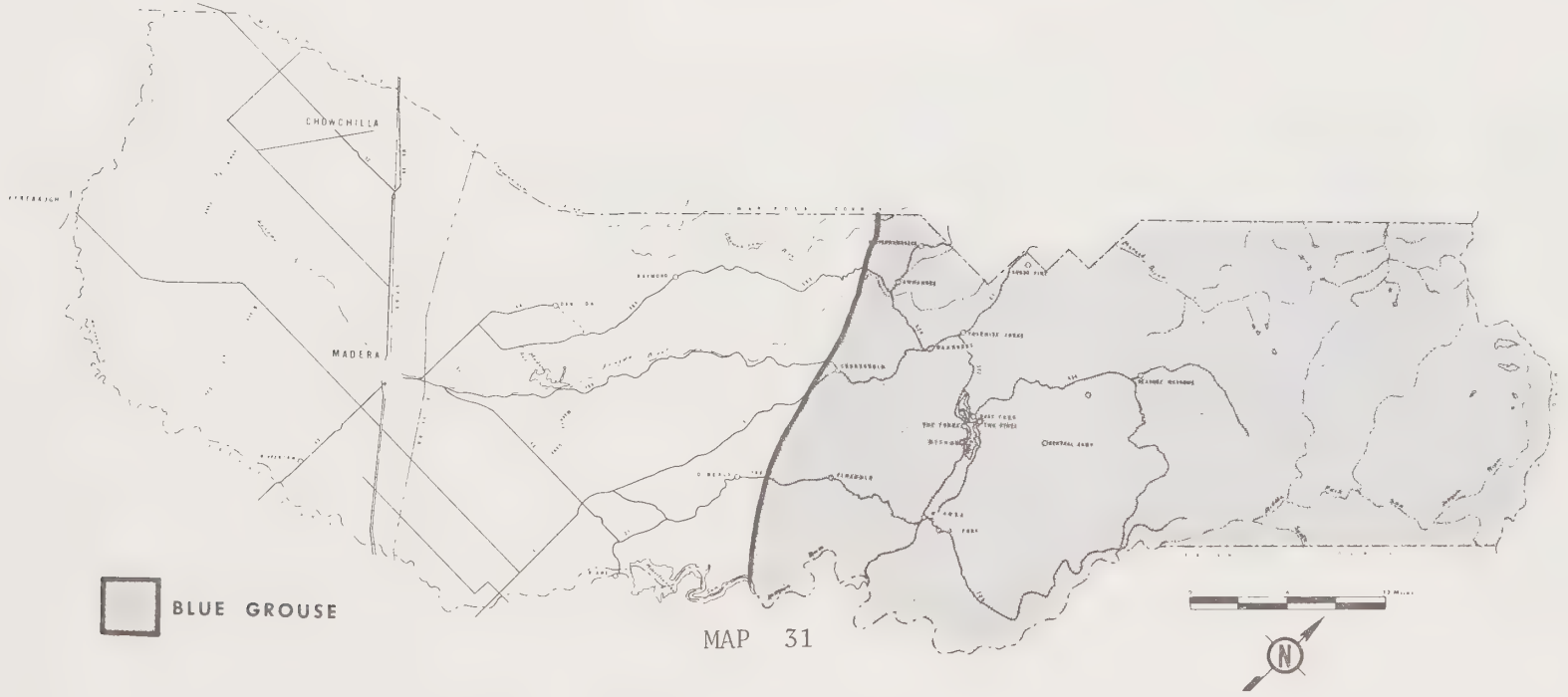
MAP 29

MADERA COUNTY, CALIFORNIA

WILDLIFE HABITAT



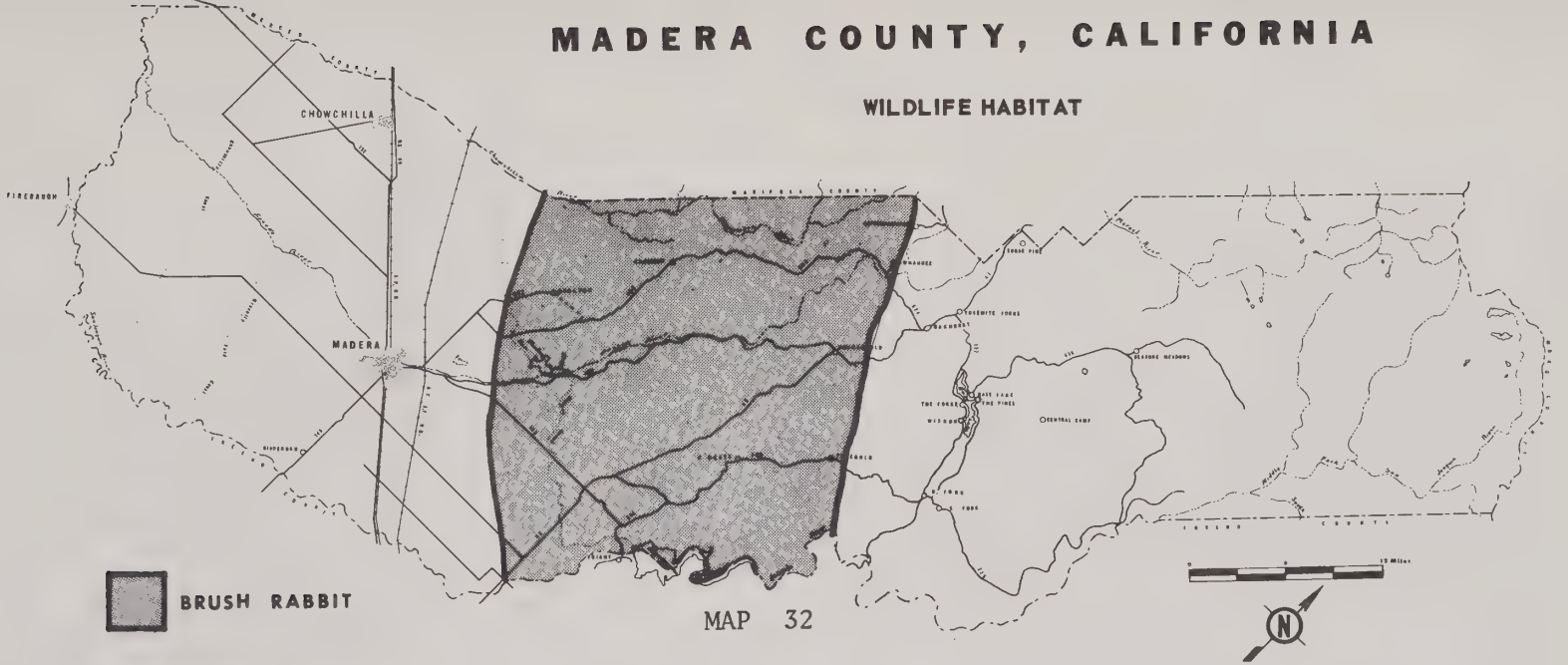
MAP 30



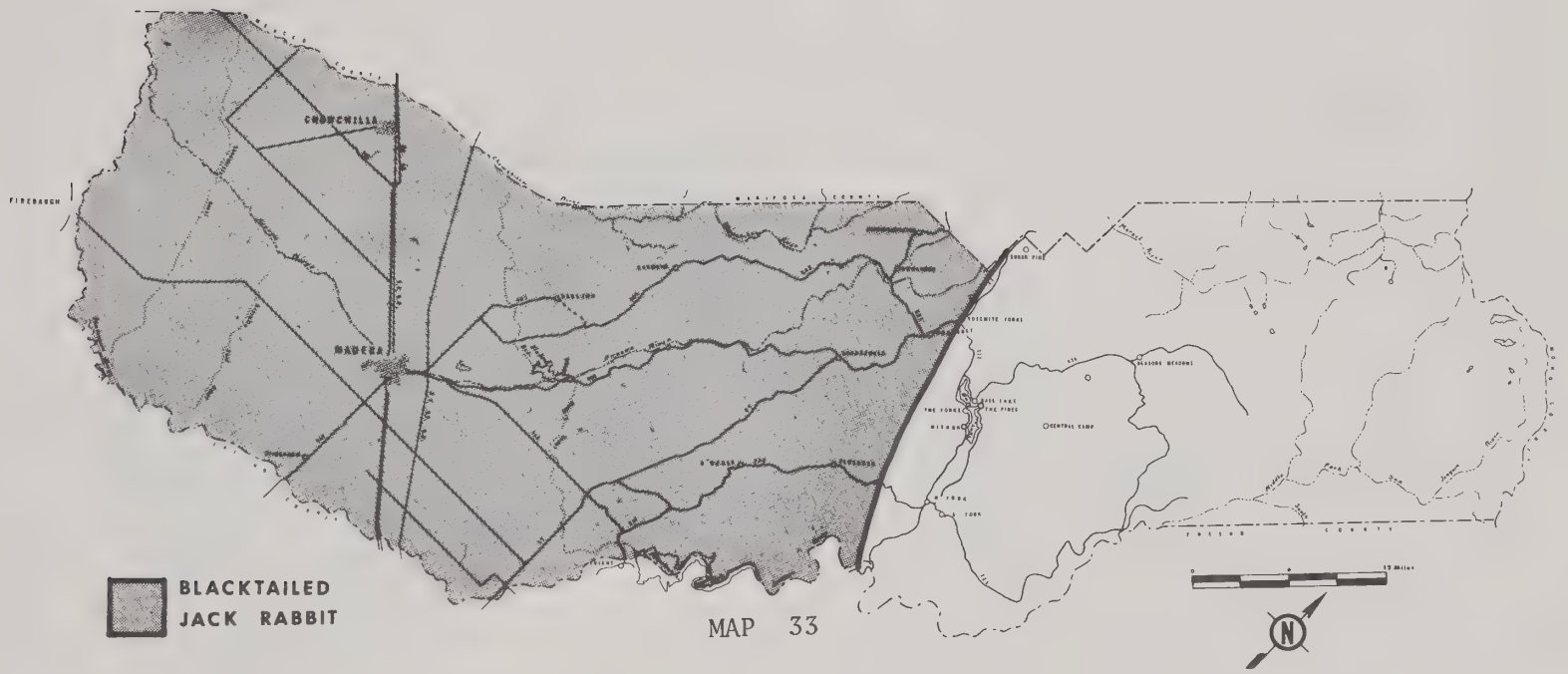
MAP 31

MADERA COUNTY, CALIFORNIA

WILDLIFE HABITAT



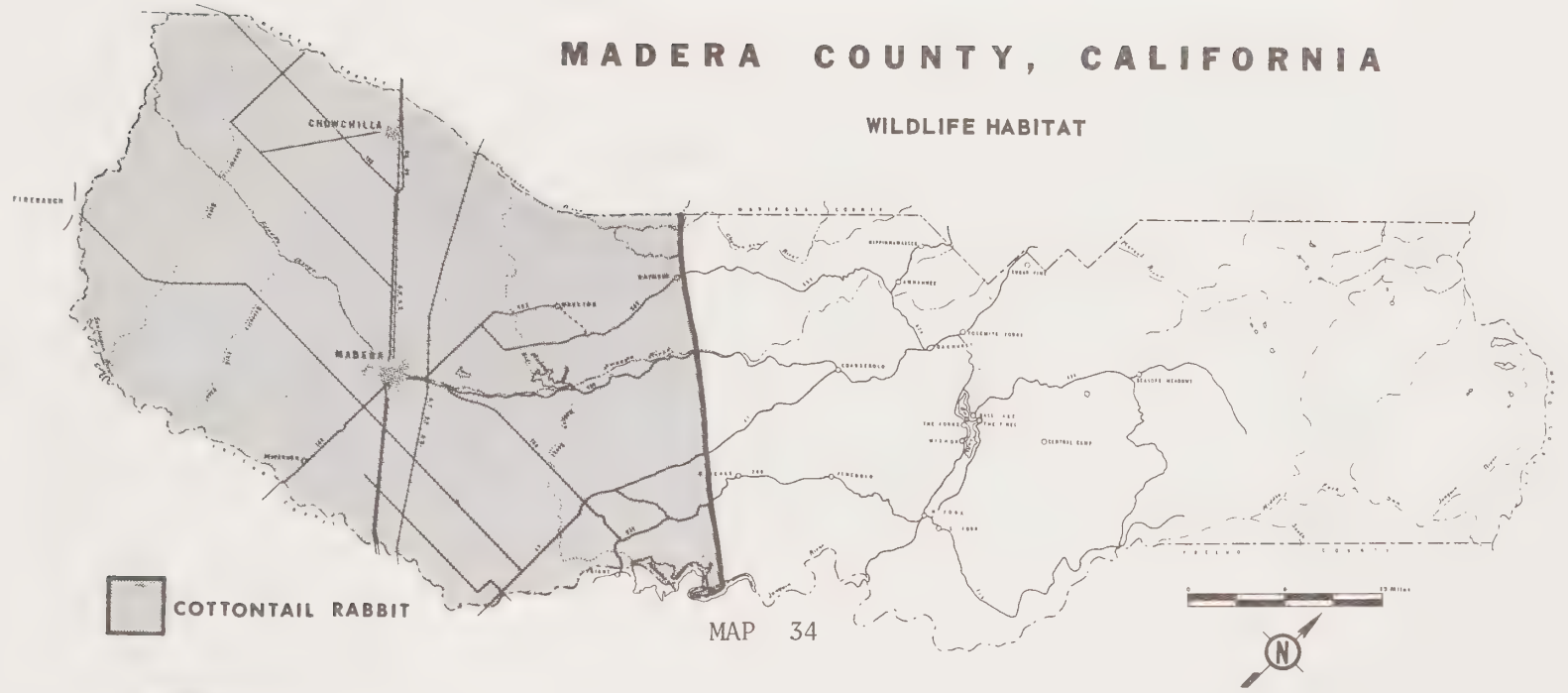
MAP 32



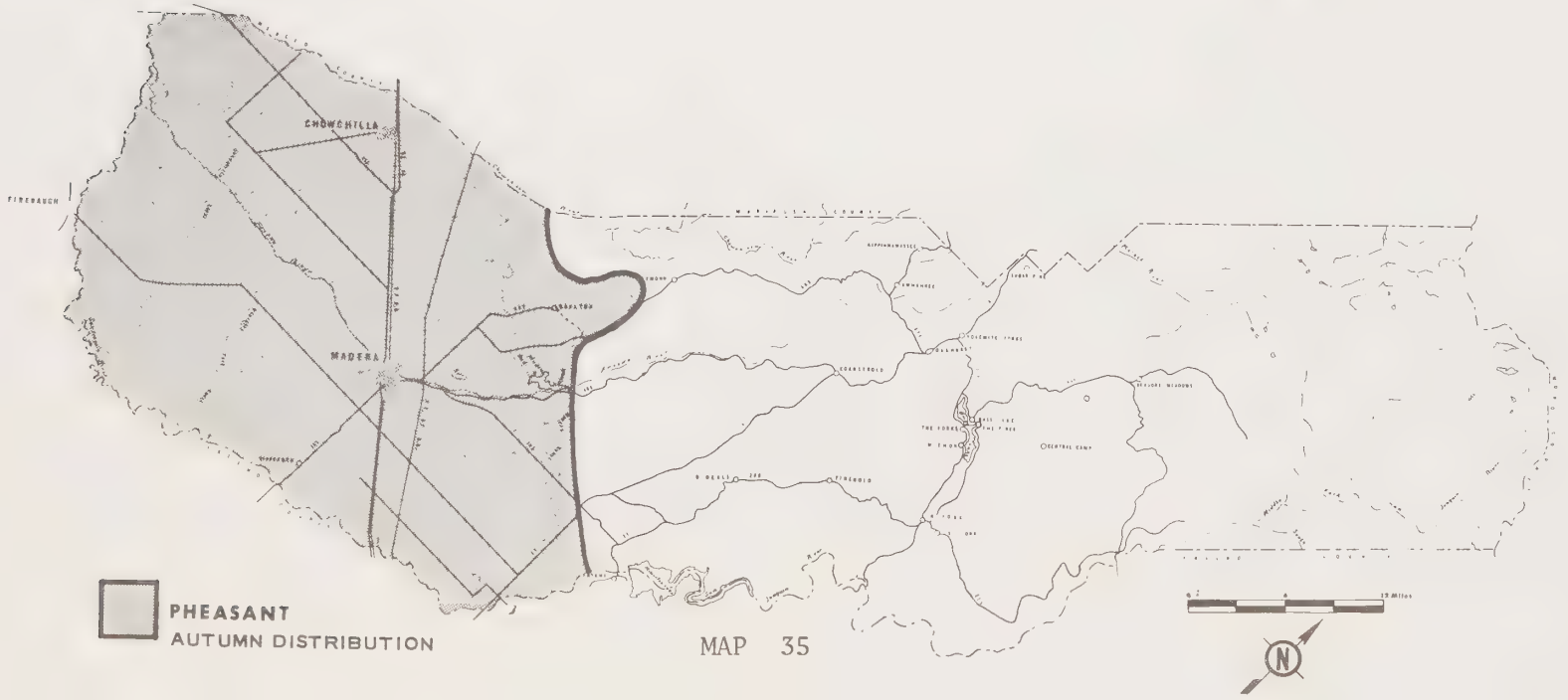
MAP 33

MADERA COUNTY, CALIFORNIA

WILDLIFE HABITAT



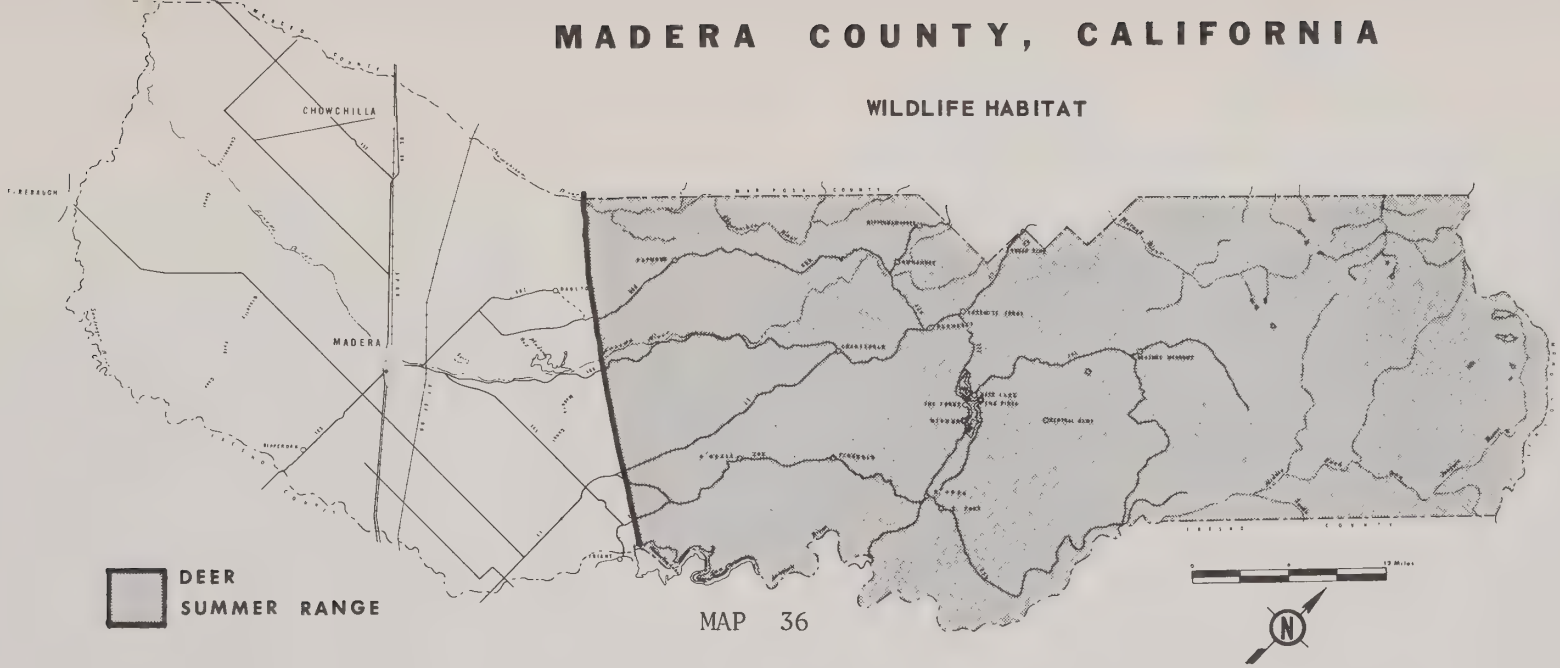
MAP 34



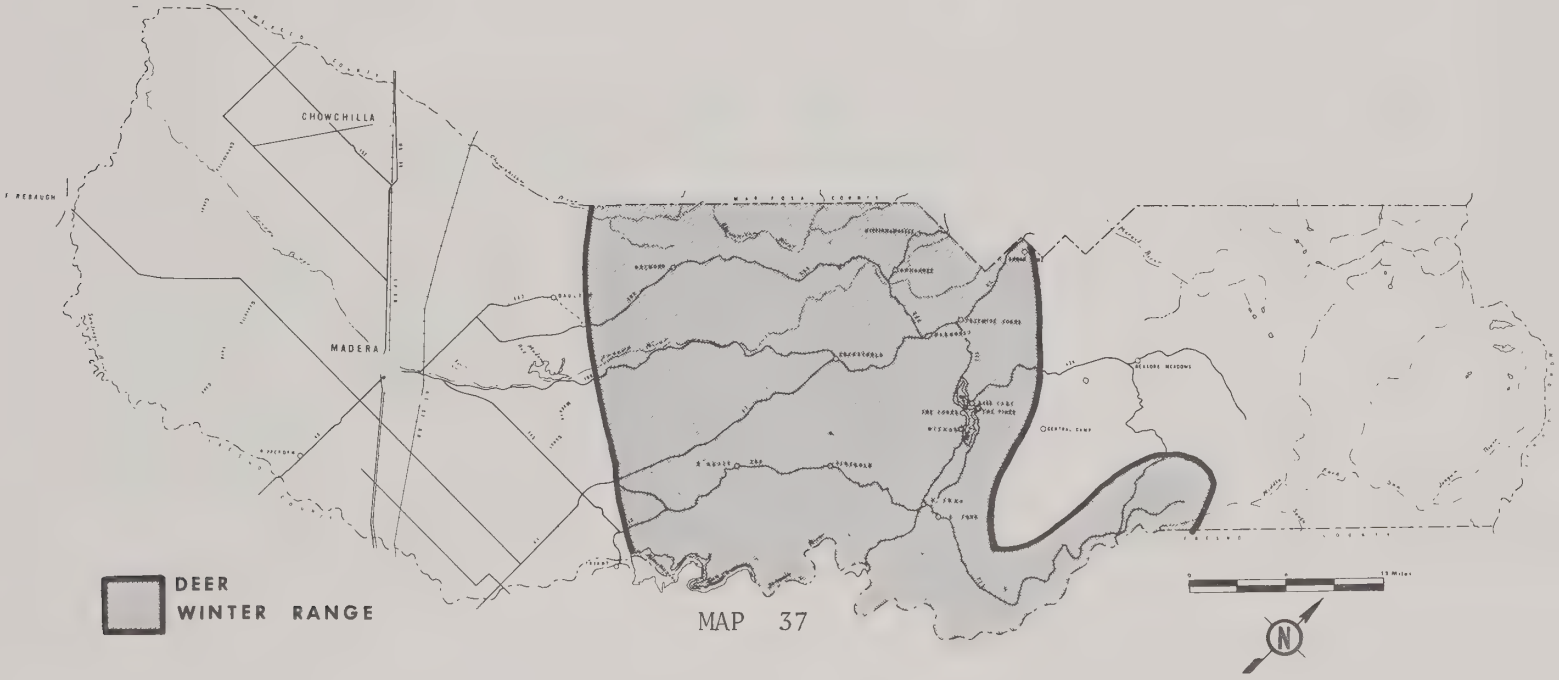
MAP 35

MADERA COUNTY, CALIFORNIA

WILDLIFE HABITAT



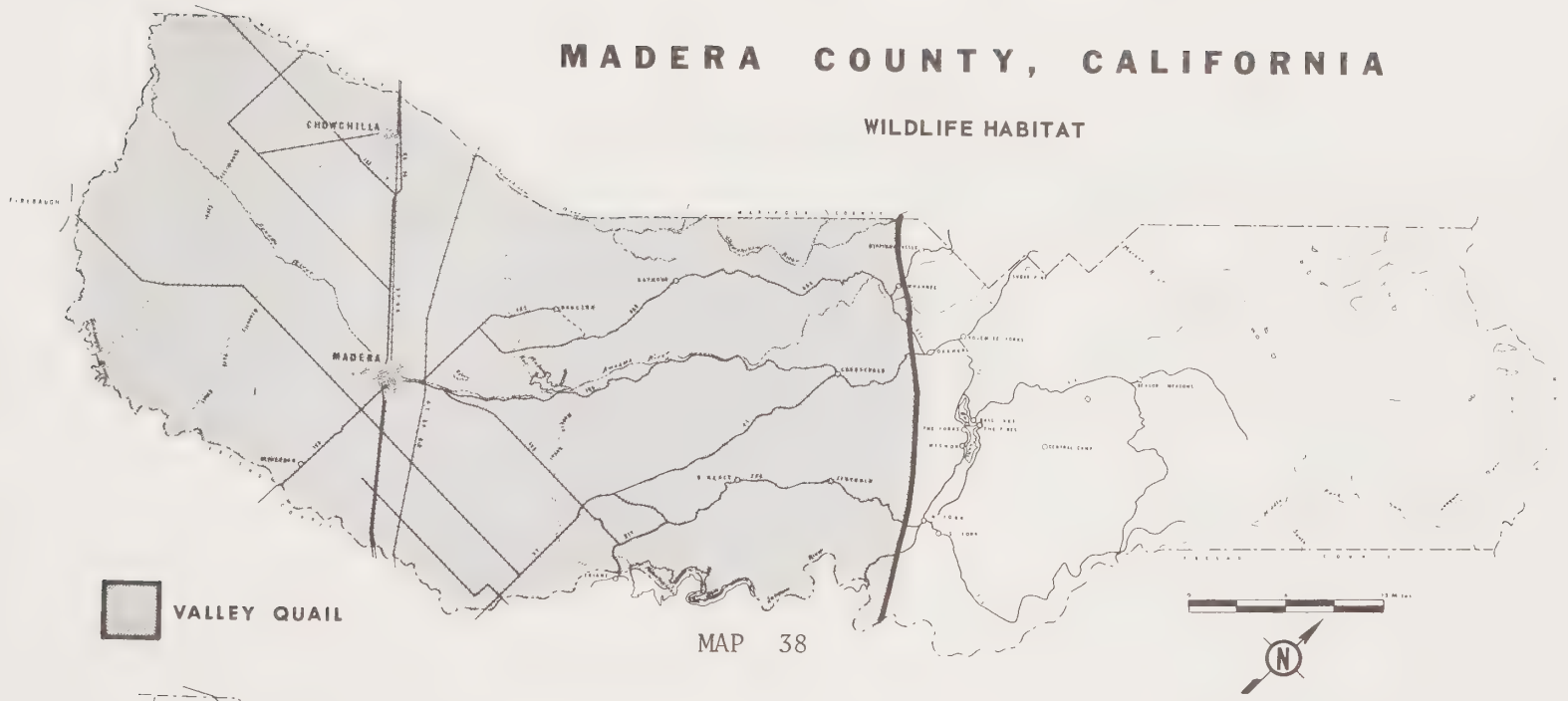
MAP 36



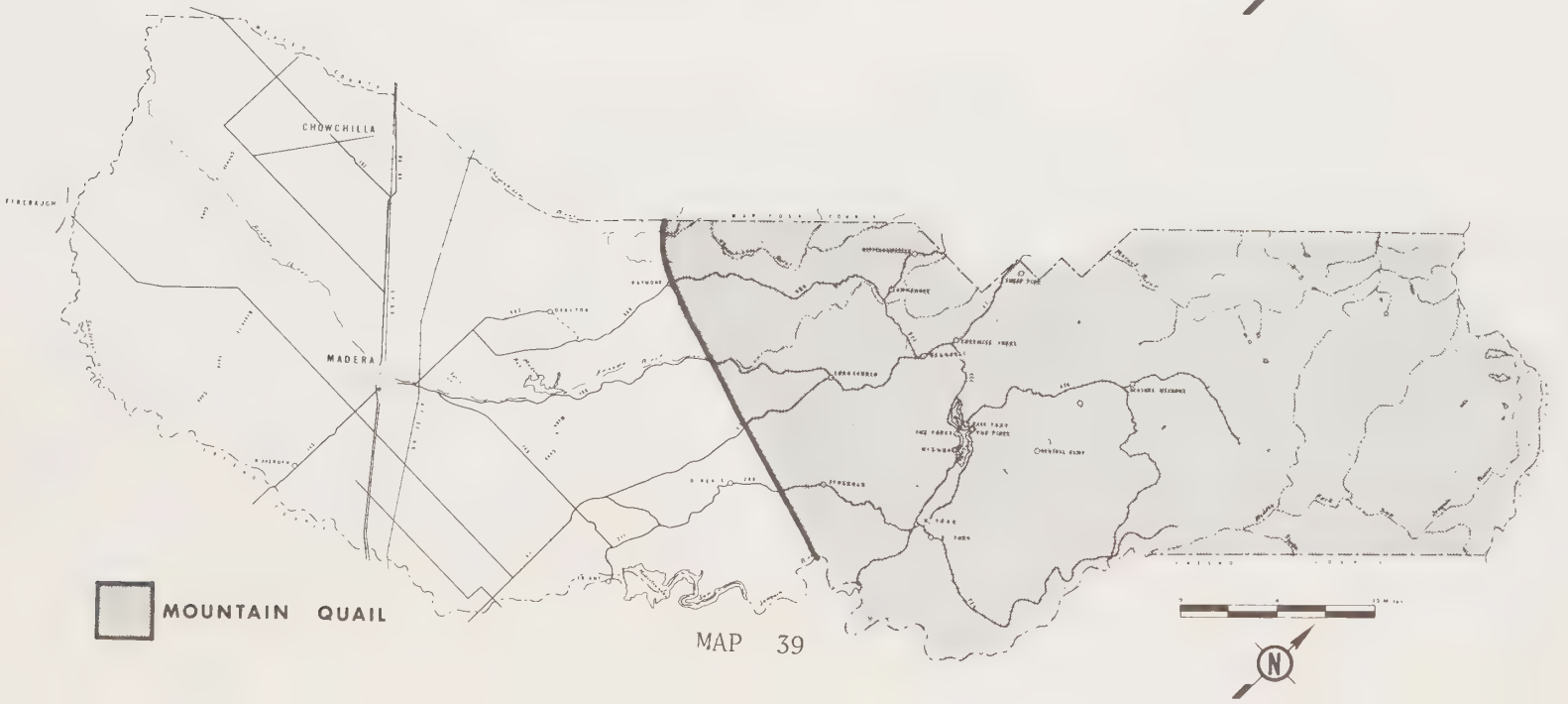
MAP 37

MADERA COUNTY, CALIFORNIA

WILDLIFE HABITAT



MAP 38



MAP 39

ACTION PROGRAM

Recent amendments to California Planning Law relating to the list of required General Plan elements to be accomplished by each county added a requirement for an Open Space Plan Element and a Conservation Plan Element. That legislation specified that each Open Space General Plan Element should have a statement of policies, a text of background materials, a diagram or diagrams,such as maps, showing those plans, and be supported by an Action Program.

This portion of the Plan Element is the Action Program which should be taken together with the map which diagrams the details of the Plan within the geographic context of Madera County. This part of the plan element presents details of how the Board of Supervisors, the Planning Commission, and other County departments will follow the intent and specific points in the Open Space and Conservation Plan. Although other directions or modes of action may be inferred from the text, these are the specific actions to be taken:

1. This General Plan Element encourages the continuation of large-lot agricultural and rangeland uses in well-suited areas of the County according to the General Plan elements already prepared and according to this Open Space and Conservation Element.

2. Those matters and items related to open space and conservation in the existing General Plan Elements are hereby reiterated and expressed anew. This Open Space and Conservation Element recognizes that new information and changes in land use development trends have evolved since the completion of those initial elements of the General Plan. In case of conflict, this General Plan Element supercedes the earlier materials. The Open Space Element of the General Plan hereby includes all existing lands under contract or agreement under the Williamson Land Conservation Act. This plan further recognizes that new lands will be included in Land Conservation Act contracts in the future. This Plan Element specifically plans for the inclusion of new Williamson Land Conservation Act areas to be included within the meaning of this Open Space and Conservation Element in the future.

3. Madera County recognizes, and the Board of Supervisors intends to resolve in conjunction with the passage of this Element, that open space values of agricultural, recreational, and other lands valuable for the purposes of this Open Space Plan are threatened by urban expansion or incompatible public or private use or development and therefore, the Williamson Land Conservation Act contracts shall continue to be made available for all lands now in agricultural use or in other uses specified in State law as being eligible for entry. The Board of Supervisors specifically recognizes that the open space values of agricultural lands and other lands eligible for entry into land conservation contracts are threatened by urban expansion or incompatible public or private use or development throughout the entire County and not just within a 3 mile distance from existing city limits.

4. The existing ordinances of the County of Madera are hereby specified by the Board of Supervisors as those regulations necessary to achieve the purposes of this Open Space and Conservation Element of the General Plan. It is anticipated that future adjustments of those ordinances may be made in order to achieve these purposes. To that end, the Board of Supervisors specifically orders that all County departments shall implement the available ordinances within their respective domains toward the end of achievement of this Open Space and Conservation Element of the General Plan.

5. Existing urban and suburban developed areas and those areas which are currently zoned or for which specific development plans have been filed are hereby accepted as is; however, providing for the upgrading of these community areas in future development programs. To that end, the Board of Supervisors hereby expresses its policy to extend the weight of its support and the direction of its regulation toward encouraging the development of existing urbanized areas in Madera County and toward the end of discouraging sprawl of urban uses throughout areas established by this plan element as open space or conservation areas.

6. The current plans and policies for the incorporated cities and those for the unincorporated communities of Madera County are hereby integrated with the County's Open Space and Conservation Element of the General Plan. The Madera County Board of Supervisors intends to evaluate urban development according to regional analysis and to confer with the cities and to refer matters of concern to the cities' Conservation and Open Space Programs to them whenever such matters shall arise in the course of activities designed to achieve the purposes of this General Plan Element.

7. Madera County includes within this Open Space Planning Program the concept of preserving critical water recharge areas in sufficient quantity to insure the continued recharge of valuable ground water resources. Certain of these areas are shown in the map diagram accompanying this text, although such areas shown do have multiple use for recreation, wildlife preservation, and other conservation and open space purposes.

8. This Open Space and Conservation Plan Element references and adopts Bulletin 135 of the Department of Water Resources; a comprehensive plan for a public water supply system in the mountain region of Madera County referred to as the Soquel Project.

9. Existing recreation areas expressed in the Recreation Element and the Land Use Element of the Madera County General Plan are reiterated here in the Open Space Plan Element. State and Federal recreation lands are also designated in this Plan. Such designation matches existing Federal and State recreation areas and anticipates the recreational areas adjoining the two new lakes associated with the construction of Buchanan and Hidden Dams.

10. Scenic highways, parkways, floodways of rivers, and some canals and reservoirs are adopted as part of the Open Space and Conservation Element, and are shown on the map diagram accompanying this text.

11. This Open Space Element of Madera County's General Plan outlines the route for the Trans Sierra Highway and recommends controls to minimize environmental damage nearby the route when the highway has been completed.

12. This Open Space and Conservation Element of the General Plan recognizes that special wildlife needs exist within the County and these needs are coordinated in this plan for open space.

13. The Madera County Planning Department is hereby specifically directed to review and relate Federal, State, and regional programs to all of the General Plan Elements of this County, and particularly to this Open Space and Conservation Element. The relationship of such State, Federal and regional programs to the County's Open Space and Conservation Element or other plan elements should be reported to the Board of Supervisors from time to time.

14. The County Administrative Officer and other appropriate County officials should, from time to time, review the general impact of programs and policies on the County, emanating from Federal and State policies, the Williamson Act, National Park Service policies, and U.S. Forest Service practices and policies, and relate the needs where apparent for more regionally-based inputs to the local economy where economic burdens are sustained by the County in helping to provide for the open space needs of the region, the State, or the Nation.

15. The Board of Supervisors specifically directs that, in addition to any other applicable ordinances, the Zoning Ordinance, the Parcel Map Ordinance, the Subdivision Ordinance, the Road Department requirements and regulations, and the Building Code be specifically applied to achieve the objectives of this Open Space and Conservation Element in the future.

16. The Planning Department is directed to make an annual review of this General Plan Element and report to the Board of Supervisors and, upon approval of the Board, subsequently report to the Council of Intergovernmental Relations of the State government in Sacramento and to the Department of Finance, where appropriate in terms of reporting on the achievement of open space and the various geographic factors related to the distribution of Williamson Land Conservation Act contracted lands.

17. The Board of Supervisors of Madera County shall directly participate in the implementation of this Open Space and Conservation Element by requiring that the necessary procedures be followed to rezone such lands to exclusive agricultural categories as a routine function during the contract forming activities each year.

RELATING WILLIAMSON ACT FUNCTIONS TO OPEN SPACE PLAN

One of the last functions of the Board of Supervisors in the annual Williamson Act contract operations should be to include those new areas entered into Williamson Act contracts or agreements into an annual amendment to the Open Space Element. Areas that are leaving the Williamson Act agreement or contract areas should be shown on the plan in terms of whether or not they are going out immediately or over the 10 year period provided for in the contract. This operation can be carried out routinely as one of the last functions of the Williamson Act contract operations and by regular amendment proceedings concurrent with the other final actions of the contract procedures, the Board could easily amend the Open Space Plan Element of the General Plan of Madera County and direct the Planning staff to prepare an annual overlay to or reprint of the Open Space Plan Map graphically describing those changes. The Planning staff should show by appropriate symbols those areas where owners have terminated their contracts and will eventually go out of the Williamson Act.

Large Lot Agricultural Zones Applied to Williamson Act Preserves and Contract Lands.

The Planning Commission and the Board of Supervisors should continue to establish large lot agricultural zoning on parcels included in the Williamson Act preserves and contracts or agreed to in the Williamson Act procedures. This will automatically maintain the required match between the Open Space Plan Element of the County and the zoning as required by Section 65910 of Chapter 4, Title 7 of the Government Code of the State of California

GENERAL REVIEW OF LAND USE TRENDS

It appears that major trends and the workings of current local zoning and land use regulations in Madera County, combined with the general policies of the Planning Commission and the Board of Supervisors are already generating a strong tide toward the conservation of open space in Madera County.

It remains for this Open Space Plan Element to emphasize those trends and regulatory devices which can achieve a long-term conservation of open space, and to emphasize those points, those systems, and those natural and regulatory devices to achieve the stated policies of conserving open space in the right places in Madera County over a long period of time.

GENERAL PLAN for

OPEN SPACE and CONSERVATION ELEMENT

MADERA COUNTY, CALIFORNIA